

The Mining Journal

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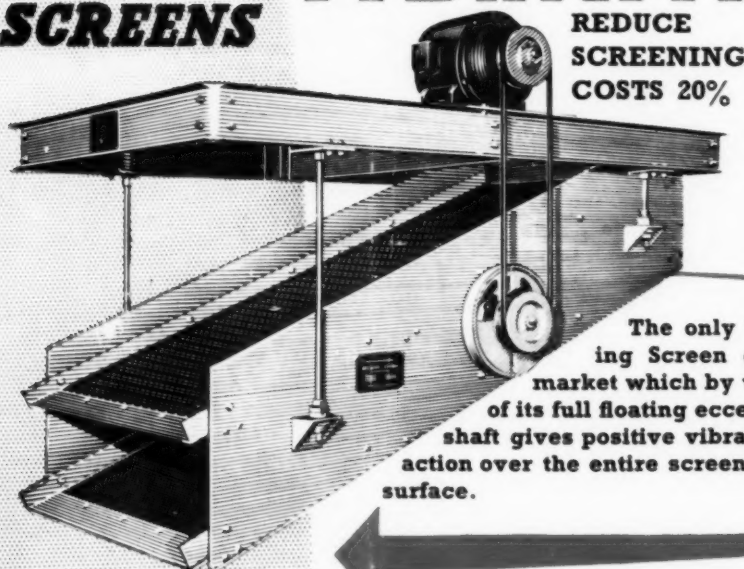
Railway & Commercial Gazette

Vol. CCXLVI No. 6300

LONDON, MAY 18, 1956

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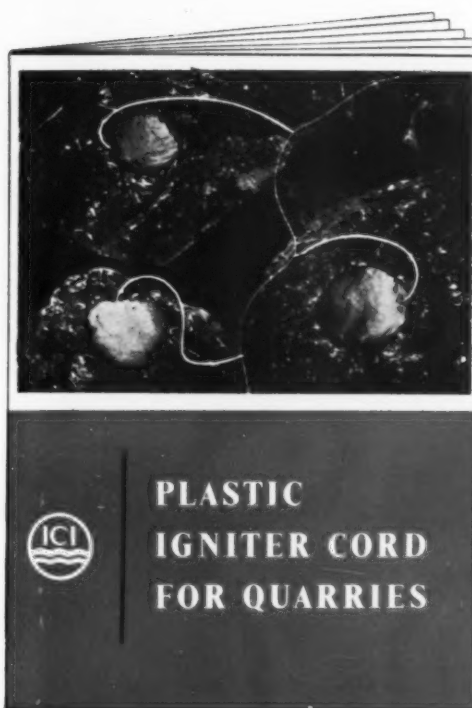


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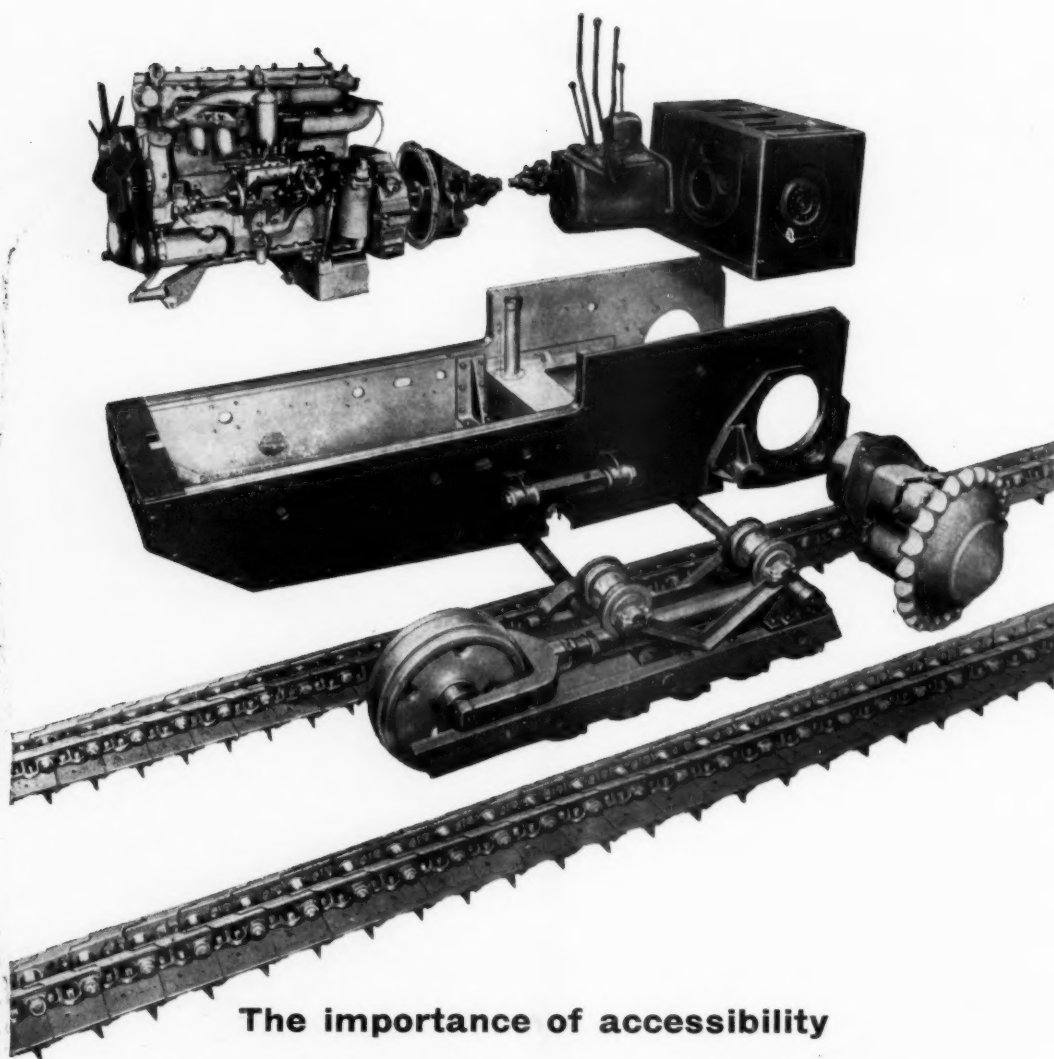


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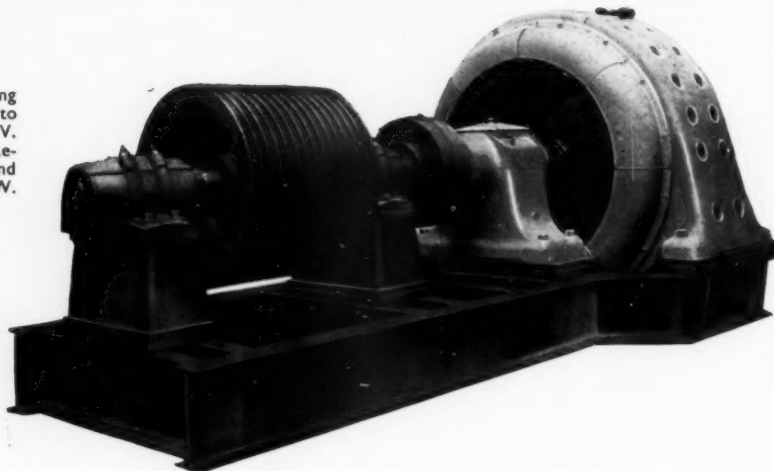
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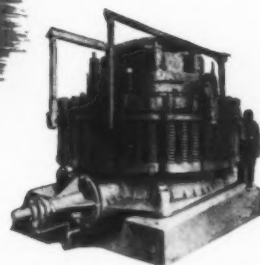
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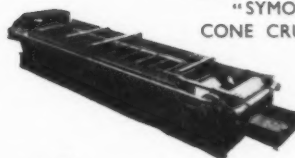
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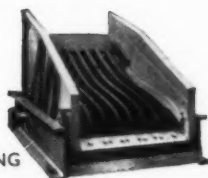
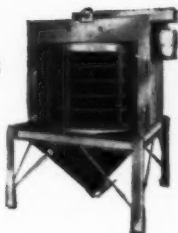


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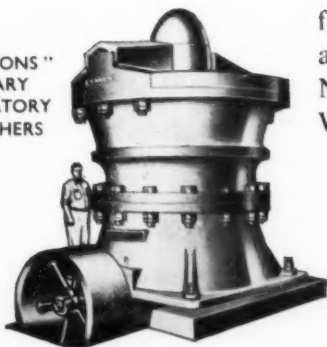


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HOW ATLAS COPCO EQUIPMENT HELPED FRANCE PRODUCE 57 MILLION TONS OF COAL IN 1955

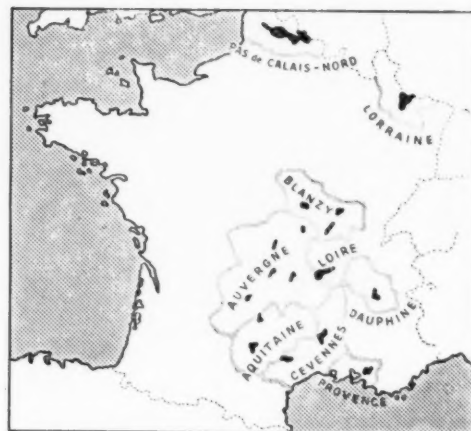
France today is one of the leading coal-producing countries in the world. The progressive modernisation policy of French mining authorities has created an industry that is one of the strongest links in the country's economy. With the introduction of new mining methods, production figures have risen year by year reaching fifty-seven million tons in 1955.

Over the last ten years France has started nineteen new mines and modernised many more. In these mines, productivity is the highest in Europe while output per man-shift saw an increase of 64% between 1948 and 1955.

GETTING AT THE COAL

The fifty-seven million tons of coal produced in 1955 entailed immense development work. It meant the drilling of 125 miles of galleries and the excavation of sixty million cubic feet of rock. With the use of fast and efficient drilling equipment on these preliminary operations, 1955's high production figure was achieved.

To speed development work, French mining engineers brought in the lightweight combination of pusher leg drills and tungsten-carbide-tipped drill steels—a drilling method pioneered by



The location of the main French coalfields in which Atlas Copco drills and Sandvik Coromant drill steels are extensively used

Atlas Copco and Sandvik in the early 'forties. 'At the present time four thousand of these light rock drills are in operation throughout the French coalfields. Many of them are *Atlas Copco* drills fitted with *Sandvik Coromant* steels.

The Atlas Copco light rock drills and Sandvik Coromant tungsten-carbide-tipped steels in use down the mines were supplied by Atlas Copco France S.A., the French company in the world-wide Atlas Copco Group.

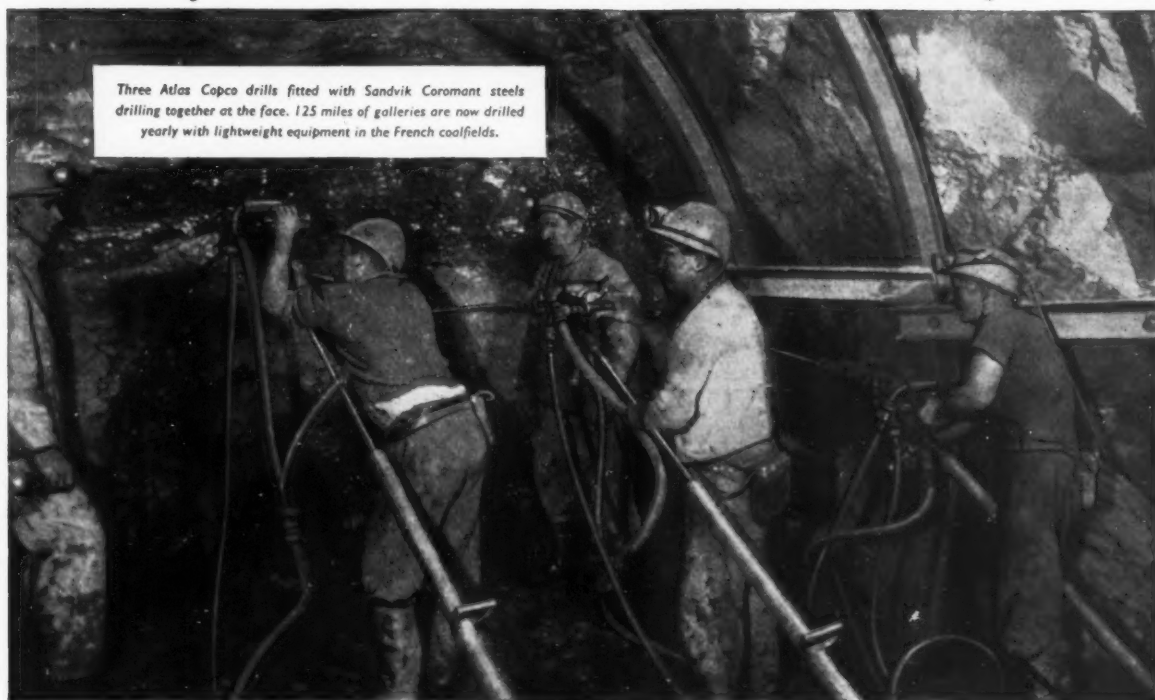
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Atlas Copco rock drills on development work down a mine in the Nord-Pas de Calais area. By speeding up development work France was able to produce 57,000,000 tons of coal in 1955.



Three Atlas Copco drills fitted with Sandvik Coromant steels drilling together at the face. 125 miles of galleries are now drilled yearly with lightweight equipment in the French coalfields.

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Atlas Copco light, one-man rock drill in action at the Henin Liétard Mine. It is fitted with a Sandvik Coromant tungsten-carbide-tipped drill steel.

The Atlas Copco Group puts compressed air to work for the world. It embraces thirty-one Atlas Copco companies and twenty-four agents, manufacturing or selling and servicing Atlas Copco equipment in more than 50 countries throughout the world.

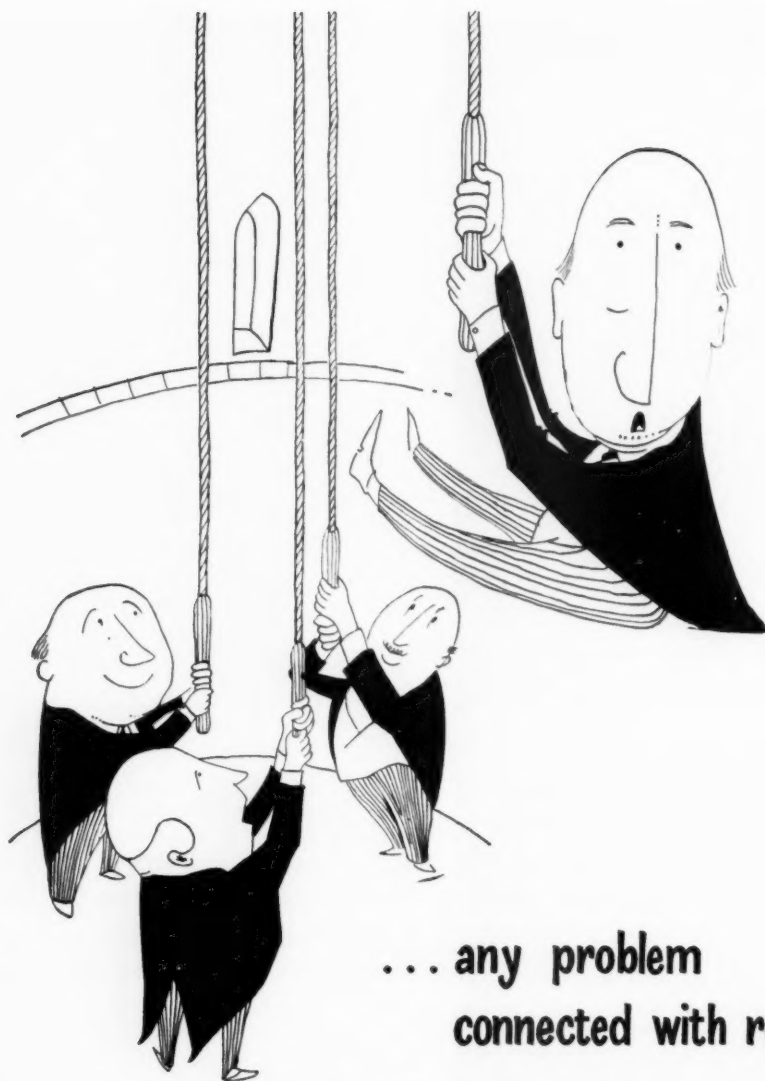
For further details about Atlas Copco equipment write to the most convenient of the addresses given here:

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The Mining Journal

Established 1835

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NOTES AND COMMENTS

Mechanization, Automation and Mining

According to a recent Press report, investors interested in "growth" stocks have been searching for firms manufacturing automation equipment in the belief that shares in this new development can still be picked up at bargain prices. They found that automation, far from being a novel field, is virtually as old as mechanization itself. Indeed, automation has been aptly defined as an automatic brain coupled to, and in control of, machines. In this sense even the earliest and most simple safety devices used in the mining industry are examples of automation, as are many of the electrical or mechanical controls associated with reduction plant.

The prominence currently being accorded to automation is due largely to spectacular advances in electronics and atomic physics which have made it possible to provide machines with the ability not only to carry out a sequence of operations without attention, but to inspect the product automatically without interrupting high-speed production and thereafter to initiate any necessary corrective action. Strictly speaking push-button mechanisms are not automation, since some degree of human control is still required.

The mining industry is one of the largest users of mechanical equipment for materials handling and, as previously indicated, is by no means a newcomer to automation, which has an obvious field of applications in the production and sorting of friable materials such as coal. Mining engineers are becoming increasingly dependent on mechanization to overcome the difficulties presented by shortage of manpower, rising costs, and the exploitation of less accessible and lower grade deposits. It may be anticipated that automation too, will make a contribution of growing importance to the economic production of metals and minerals, not only by increasing the efficiency and economy of mechanical systems of handling and sorting, but also by performing various operations which cannot conveniently be carried out by other methods.

The Department of Scientific and Industrial Research, whose report on the subject has just been published, foresees little scope for automation in mining. On the other hand, the Principal of Cornwall Technical College stated last week

at a function held by the Camborne School of Mines that automation was coming to the mines as it was to the factory.

The latter view is also held by a U.S. technological expert, Mr. F. R. Sell, who told the 1956 Coal Convention of the American Mining Congress last week that automation would be used in the coal industry to an increasing degree in order to continue the trend towards increased production per man day. At the same convention Mr. W. R. Morton, applications engineer of the General Electrical Company, said there were certain phases of coal haulage which could readily be made automatic. Automation might also be applied to hoisting operations in shaft mines, to handling coal through the preparation plants, and to control of the movement of loaded wagons at their accumulation point. There can be little doubt that comparable operations in metal mines, given suitable conditions, would also be adaptable to automation.

In South African gold mines, for example, permanent geiger counter installations are positioned in association with weightometers on belts conveying reef and waste. The equipment will accurately measure the actual amounts of minerals being delivered respectively to the reduction works and waste dumps, thus detecting any errors in tramming reef or waste. This type of application could doubtless be classified as automation, providing, of course, that the measuring equipment was associated with a control mechanism which was brought automatically into action whenever an error came to light.

An impressive indication of the ever-increasing range of equipment suitable for the requirements of mines and metal refineries has been afforded by certain units displayed at the Mechanical Handling Exhibition at Earls Court, London, which closes on May 19. Whether by design or accident, this two-yearly event coincided with the annual exhibition of the Physical Society, at which instruments, components and materials likely to contribute to the future development of automation were on view.

One conclusion which emerges very forcibly from the almost bewildering variety of equipment at both exhibitions is the importance of selecting the most suitable machines and devices for a particular mine or application. The benefits of efficient mechanization, both on the surface and

underground, have been abundantly demonstrated by operating results in many parts of the world. Yet it is evident that such an almost unlimited range of choice must also present possibilities of heavy losses through the purchase and installation of equipment which is not ideally suited to the requirements of a particular job, an error into which manufacturing companies have been known to fall. It is now widely realized that mechanization is essentially a matter for specialists and should on no account be embarked upon without expert guidance. Obviously this is equally true of automation. Without delving any further into such an extremely complex subject, we might recall the dictum of a former President of the U.S., Mr. Herbert Hoover—a mining engineer of considerable prominence—who pointed out that mining in many of its aspects requires a flexibility of approach not consonant with mass-production methods.

So far as automation is concerned an industry such as mining chronically afflicted by shortage of manpower, is unlikely to be faced with the problem of widespread redundancy as a result of further advances in labour-saving techniques. Nevertheless current experience in the British motor car industry underlines the importance of effective machinery for ensuring that the introduction or extension of automation is undertaken with the understanding and co-operation of the workers concerned.

Enough Markets For All Materials

The robust confidence of the aluminium and magnesium industries in a future offering immense scope for expansion, is shared by leading steel producers. There are at present no indications that the rapid progress of aluminium and plastics will seriously interfere with steel markets and production. This observation was made by Mr. Roger M. Blough, chairman of the United Steel Corporation, at a luncheon following a tour of the corporation's new research centre of Monroeville, Pa.—the largest steel laboratory ever made.

Mr. Blough said that there was "definitely a place, and an expanding place," for aluminium and also for plastics. In fact, the more aluminium and the more plastics used, the greater the amount of steel that would be required. The U.S. Steel Corporation itself is now making plastic pipe. It was further disclosed that the company was producing plastic-coated steel and putting it into the hands of possible users to try it out. At present the main applications are in the motor car industry for use inside glove compartments and on visors. Aluminium-coated steel is also being produced and is finding a definite field in mufflers on motor cars, ovens, and certain types of containers.

These views are the more encouraging for being expressed at a time when the U.S. motor car industry is experiencing a set-back resulting from temporary over-production and when some apprehension is being felt on both sides of the Atlantic as to the imminence of what might be euphemistically termed a period of readjustment.

Having regard to the rapid growth in world population, the more intensive development of the "backward" areas, and the immense potentialities of technological advances, still at a comparatively early stage, the general trend of demand for all materials which have industrial value can scarcely fail to be upwards. Though fluctuations are liable to occur from time to time, the basic problem facing producers of minerals and metals is not the challenge presented by alternative materials, synthetic or otherwise, but how to satisfy the requirements of a world which, like *Oliver Twist*, is continually asking for more. Producers capable of offering efficient materials at competitive prices

have sound reasons for confidence, particularly if their products are backed by strong research departments continually seeking potential fields of application.

India's New Five-Year Plan

At the end of April the Prime Minister of India, Mr. Nehru, announced plans to double the number of industries which would be Government monopolies, or which would be subjected to Government control in respect of future developments. He stated that the Government, pursuing its Socialist policy, would progressively assume the predominant responsibility for new industries and transport facilities. It would also undertake state trading on an increasing scale.

In the previous Government industrial policy statement of April, 1948, only nine industries were reserved to the State, among them being coal, iron and steel, atomic energy and mineral oils. Now industries are to be divided into three categories: first those in which future development will be the exclusive responsibility of the State; secondly, those which will be progressively State-owned and in which the Government will generally take the initiative for new undertakings, but in which private enterprise will supplement the efforts of the State; and thirdly, all remaining industries, which will be left generally to private enterprise.

Seventeen industries are listed in the first category. They include *inter alia* atomic energy; iron and steel; heavy plant and machinery for iron and steel production and for the mining and other basic industries; heavy electrical plant; coal and lignite; mineral oils; atomic energy minerals and the mining of iron ore, manganese ore, chrome ore, gypsum, sulphur, gold, diamonds, copper, lead, zinc, tin, molybdenum and wolfram. Four industries in the first category—arms and ammunition, atomic energy, railway transport and air transport—will be complete Government monopolies. In the remainder, the Government reserves all responsibility for future development.

The Planning Commission's second report—constituting the new Five Year Plan—was signed by all members of the Planning Commission on May 15. The members were the Prime Minister; the Finance Minister, Mr. Deshmukh; the deputy-chairman of the Commission, Mr. Krishnamachari; the Minister for Irrigation and Power, Mr. Nanda; Mr. K. C. Neogy and Dr. J. C. Ghose. The plan is already in operation as from April 1, 1956. It was to be presented to both Houses of Parliament on May 15 for approval during the current session.

Total Government expenditure on the Plan is currently estimated at Rs.4,800 crores compared with Rs.4,300 crores in the original programme. This will involve foreign assistance to the extent of Rs. 8,000,000,000 (£600,000,000) during the next five years.

The main economic emphasis will be on industrialization, based on the expansion of the steel industry and the development of non-ferrous metal resources. Three steel plants each of 1,000,000 tons capacity are being built, one by the U.S.S.R. another by Krupp-Demag, and a third by a consortium of British firms known as the Indian Steelworks Construction Company. The British-built plant will be situated at Durgapur in West Bengal and is estimated to cost £80,000,000. In addition to the capacity of 3,000,000 tons represented by these three plants, India proposes to increase iron and steel production by 1,585,000 tons to 3,181,000 tons annually by 1961. The country's total installed ferro-manganese capacity is to be raised by the same date to 160,000 tons a year.

An Expert Committee on Aluminium is to be set up to determine the quantity of aluminium which the country must produce during the second five year plan, the loca-

tion of the aluminium factories, and the processes that may be used for the production of aluminium. Assessing the country's bauxite deposits will be among the responsibilities of the committee. Plans for the construction of a smelter at Hirakid capable of producing 10,000 tons of aluminium annually have been announced by Aluminium Limited. The plant will be capable of expansion to 20,000 tons annually.

One of the main objectives of the Planning Commission is to accelerate the pace of development of the mineral industry. The Indian Bureau of Mines is to undertake detailed prospecting of specific properties; research utilization of low-grade ores; regulation of mineral concession grants; the supervision and regulation of mining operations; and the collection of statistics.

A month ago we referred in these columns to the unwisdom of India's decision to nationalize gold and diamonds, particularly at a time when the Government was critically dependent on foreign capital for its programme of mining and industrial expansion. (*Mining Journal*, 13/4/56, p. 443.) It would appear, however, that gold and diamonds are by no means the only branches of the mining industry to be wholly or partially nationalized under the Plan. Nor are the Mineral Concession Rules such as to encourage private enterprise to exploit the limited field which remains for them. At a meeting of the Mineral Advisory Board in 1954, two resolutions were passed: one requesting the Central Government to delete or modify a proviso under Rule 24, which empowers a State Government to refuse a mining lease after prospecting has been done under a prospecting licence, and the other requesting the Central Government to prescribe a time limit for the disposal of applications by the State Governments. In his presidential address at the 31st annual meeting of the Geological, Mining and Metallurgical Society of India, Mr. M. K. Ray stated that no steps had been taken as yet to give effect to either of these very pertinent resolutions.

Mining Expansion in the Philippines

Philippine mineral production in 1956 will exceed 200,000,000 pesos in value, predicts Mr. Benjamin Gozon, Mines Director. This will represent an increase of at least 30 per cent over last year's figure of 167,780,000 pesos. Philippine Iron Mines will increase its output of iron ore by some 500,000 tons yearly, for an annual value of 8,000,000 pesos. Mati Iron Mines will go into production this year, tapping an ore reserve estimated at 1,330,000 tons. Atlas Consolidated is to increase its daily production of copper ore from 6,000 to 10,000 tons. Masara Mines will have a full year's production in 1956. During its initial operations for a limited period last year it produced 10,534 tons of gold and copper ore, valued at 243,583 pesos.

Palawan Mercury, which started operations in August, 1955, reached capacity production in December and can now produce 7.6 s.tons of mercury a month. This company's blocked out reserves, as of May 31, 1955, were reported to total 135,000 tons containing approximately 5,100 tons of mercury.

Mindanao Mother Lode Mines expects its copper mining operations at Cabangan, Zamboanga, to reach 300 tons a day during April. A first shipment to Japan of 1,200 tons of concentrates is scheduled for the middle of the month.

The Government is making preliminary surveys for the construction of a commercial airstrip on Nonoc Island in Surigao, the site of rich nickel-iron deposits. As reported in a previous issue, four North American companies, as well as two Philippine concerns, are planning to take part in the development of these deposits. The possibility of establishing a nickel smelter in the Philippines if prospects are favourable has been suggested.

Australia

(From Our Own Correspondent.)

Melbourne, May 1.

The Department of National Development is to extend its search for oil in the Gippsland, Victoria, area into Bass Strait, and aerial surveys are to be commenced. Soon after the discovery of oil, in unpayable quantity, in eastern Victoria, in the late 1920's, it has been thought that the source of the small occurrence located was beyond the shoreline, and under the waters of Bass Strait, which are shallow for some distance seaward.

The present project has sprung from the discovery of indications of oil in Jurassic rocks in the Woodside dome, and the fact that the Victorian Jurassics are fresh water beds, suggesting the migration of oil from an older, and more likely origin. The survey will be carried out to a distance of about 50 miles from the coast line, between Corner Inlet and Cape Everard.

KING ISLAND SCHEELITE EXPANDS ACTIVITIES

King Island Scheelite (1947) Ltd., operating on King Island, Tasmania, earned a profit of £A1,014,661 in the year to October 31, 1955, bringing the total profit over the past five years to over £A4,000,000. The product has been sold to the British and United States Governments. The British contract will expire in May, and the United States contract, two years later. No announcement has been made regarding new contracts for purchase of the scheelite concentrate. The mine is worked by open cut, and ore reserves are estimated at 2,970,000 tons, or 11 years' life at the present rate of extraction.

The Company has considerable surplus funds and is planning their investment in other sound ventures and will extend activities into the exploration for new tungsten occurrences, or other metals. This is regarded as a wise move, for the company has the money, and also a technical staff of high calibre.

OBSTACLES TO BEACH SANDS' PRODUCTION IN N.S.W.

The working of beach sands for rutile, zircon, monazite, and at present unsaleable, ilmenite, along the east coast of New South Wales and Queensland is an important mining activity at the present moment.

The demand for rutile, the invaluable metal in aeronautics, has occasioned a boom leading to applications for more than 600 applications for leases and authorities to prospect. At one time, the country's mineral wealth held priority, and there were only limited restrictions and very few prohibitions on the search for, and the mining of minerals. Despite the national importance of the export of rutile—about £A1,500,000 per year—which has every prospect of a large increase, the unique importance of the metal, and the fact that Australian's eastern coasts contain the world's largest reserve of the mineral, strenuous efforts are being made to restrict and even prohibit the mining of rutile along the coast.

The New South Wales Government has stated that no leases will be granted that conflict with the public interest, and it is believed that vigorous objections will be lodged against many lease applications. The objections will be in the interests of surfing clubs, tourist resorts, scenic roads, and week-end settlements, fishing, and siltation. If this attitude is carried to even moderate success, it will mean the irretrievable loss of much of what is one of the most valuable of minerals at the present time.

NUCLEAR ENERGY IN MINING—II

World Uranium Reserves and Production

The following article discusses the reserves of uranium contained in the earth and the output achieved to date by the various producing countries. The article is the second of three instalments devoted to a survey of the raw materials of atomic power development with particular reference to mining, and is a part of a careful analysis of the disclosures made to an international conference on the peaceful uses of atomic energy held at the European Headquarters of the United Nations in Geneva during August 8 to 20, 1955.

Uranium is present in the earth's crust to a similar extent to lead and zinc and is found concentrated into economic orebodies under a variety of geological conditions. Little is known of Russian resources and at present there seems little likelihood of East-West trade in prescribed materials. The Western World has sufficient reserves of uranium to maintain any atomic power development programme yet envisaged.

At present uranium ores are produced on a large scale in South Africa, Canada, Australia, the Belgian Congo and the Colorado Plateau area of the United States. The last-named consists of a large number of small producers working areas of erratic occurrence and with the discovery of the Blind River deposits of Canada it may be expected that the Colorado Plateau will become less significant and the consolidation of smaller producers there can be anticipated.

Production figures for uranium mining are not published but from available information the approximate structure of the industry can be estimated.

WORLD PRODUCERS

South Africa's revenue from uranium production was about £30,000,000 during 1955 and at £4 10s. per lb. of U_3O_8 , this would be equivalent to a production of some 3,000 tons. The anticipated increase in revenue to £53,000,000 would indicate an ultimate productive capacity of nearly 6,000 tons annually. We do not know the actual price paid for South African uranium, however, only that it is such as to cover working costs and show a reasonable profit. Comparing the uranium profits for 1955 (about £12,000,000) with the revenue it would appear that the profit margin is, in fact, substantial and either working costs are very low, or the price paid for South African uranium is higher than elsewhere.

Published grade figures for the Witwatersrand conglomerates range between .005 per cent and .06 per cent U_3O_8 . Knowing the tonnage of residues treated we can estimate the grade more accurately using the figures extracted for uranium production. The uranium programme in South Africa requires chemical reagents in the following quantities:

Limestone	...	120,000 tons per annum
Burnt Lime	...	180,000 " " "
Sulphuric acid	...	468,000 " " "
Glue	...	4,800 " " "
Manganese ore	...	216,000 " " "
(40% MnO_2)		

The amount of manganese dioxide required per ton of residues is 10 to 15 lb.; over 15 lb. the increased recovery is slight. The tonnage treated is therefore in the region of 14,000,000 tons annually, a figure of the same order as the published mill throughput figures for the scheduled uranium producers although it must be remembered that accumulated slimes are also treated. If the previous assumptions are not seriously incorrect, then the average grade of the slimes is about $\frac{1}{3}$ lb./ton. At this grade the chemical reagents listed above would give rise to a charge of about £1 per lb. of U_3O_8 produced.

Little published information is available on production from the Australian uranium mines at Radium Hill or Rum

Jungle. Some doubts have been expressed about the grade of the Radium Hill mine where 450 tons of ore is being hoisted daily but published analyses of Rum Jungle ore indicates not only the presence of high-grade uranium ores, but also valuable base-metal contents.

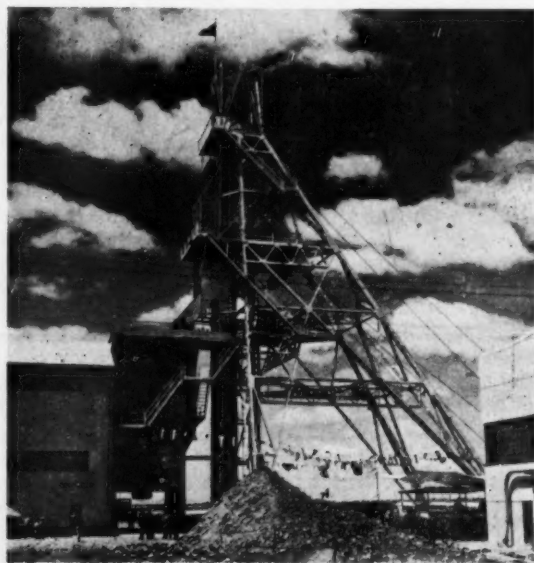
No production figures for the Belgian Congo have been released since 1947 when about 10,000 tons of "uranium minerals" annually were being produced. In 1952, 60 per cent of the world's uranium production was stated to be derived from these deposits, but this proportion must be reduced following the large scale entry of South Africa into the field of uranium production.

Although she has long been a producer of radioactive minerals the importance of Canadian uranium production has undergone a substantial change since the discovery of the Blind River deposits. The uranium at Blind River is found in a conglomerate not dissimilar from the Witwatersrand banket but in Canada the uranium minerals are of more importance than the gold content. Published figures indicate huge reserves at a grade of about 2 lb. U_3O_8 per ton of ore. The growing interest in this field is such that Canadian production is likely to rival that of South Africa.

RELATIVE IMPORTANCE

By the time atomic energy generation is making an important contribution to world energy requirements, uranium producers of the Western World may line up in the following order: Canada, South Africa, Belgian Congo, U.S.A., Australia.

The first two named would be producing over 5,000 tons of U_3O_8 annually and therefore account for a large proportion of the anticipated requirements of the Western



The headframe of the Main Shaft at Radium Hill, S. Australia



Eldorado Mining and Refining Ltd. in the important Beaverlodge area of Saskatchewan, Canada

World, whilst the Belgian Congo production must be substantial, and there are, of course, many other producing mines outside the countries mentioned. The strategic incentive for countries to develop indigenous sources of uranium is strong, and it is apparent that the potential production of uranium is more than adequate for the envisaged needs of power generation, and that as the mines came into full production, the increased competition between producers which may result makes any significant increase in the price paid for uranium unlikely.

POTENTIALS OF NUCLEAR ENERGY

On the obverse side, uranium producers can point to the many other possible fields for atomic energy development besides the obvious one of power generation in central land-based stations. Indications in recent months are that nuclear power might encroach on the preserves of the conventional solid fuels in blast furnace operation and compete with the distillate oils in aircraft and marine propulsion. The U.S. submarine *Seawolf* launched in June, 1955, is propelled by a reactor fuelled with enriched uranium and moderated by beryllium whilst the *Nautilus* uses zirconium-sheathed uranium as a fuel. The power plant for this vessel alone is said to have cost \$27,000,000, but the prospects of long-term operation without refuelling have obvious civil and military attractions. This consideration is perhaps even more important with aircraft.

Present-day jet aircraft, whilst capable of supersonic speeds, have a high fuel consumption and limited duration in the air. Aircraft reactor experiments commenced in 1954 and the possible development of aero-atomic engines to power the aircraft of the future indicates that the nuclear power field could extend widely and swiftly beyond our present vision.

REACTOR FUELS

In assessing the probable consumption of uranium in the next two decades it has been assumed that it will be natural uranium, or uranium enriched in the U-235 isotope, which will be used to fuel atomic power reactors. In Britain, where until recently research has been entirely in the hands of the Atomic Energy Authority, Government policy completely validates this assumption as industry has so far only been allowed access to technical data covering the construction of reactors of the Calder Hall type. As the costly research necessary for the development of more advanced reactor types must remain mostly in the hands of the authority, private industry must perforce depend on the authority for the design of reactor it is to build. This problem has to some extent been overcome by British com-

panies who have established partnership with American industrial concerns which have been permitted fuller participation in atomic power development, and this cross-fertilization of ideas may to some extent negative the effect of the Government mandate.

However, Government thinking on both sides of the Atlantic centres around the atomic bomb, and the policy would appear to be the dissuasion of nations from the production of fissile uranium which could be used for military purposes, thus enabling efficient "policing" of atomic military strength throughout the world. This policy is augmented by the offer of natural uranium reactors by Britain and where enrichment is desired by the sale of U-235 (as recently announced by Britain and the U.S.A.) in controlled quantity for specific projects. In this way the production of fissile uranium can be fostered in the Western World and economic domination of this new industrial field achieved.

BREEDER REACTORS

The fissile material used in reactors can be :

- (1) U-235 produced from natural uranium by the gaseous diffusion process as is done in the British U-235 factory at Capenhurst.
- (2) Plutonium produced by irradiation of uranium in piles such as those at Windscale in Cumberland or
- (3) U233 made in similar fashion from natural thorium.

It is the third of these fissile uranium systems which offers the exciting possibility of a positive gain factor in reactor operation, that is the production of more fissile material during power generation than is consumed. The fast breeder reactor now being constructed at Dounreay is of this type and although the large capital cost and expensive processing of fuel elements required detracts from the obvious advantages of such a system, its eventual use in commercial power production will undoubtedly come about. The advent of thorium as an atomic fuel, perhaps the atomic fuel, will, however, be delayed by the necessity for building up the large initial inventories of fissile material required for a reactor of this design.

Nevertheless, as a metal of growing importance in the atomic field, thorium is included in the review of material requirements for nuclear power generation.



Cleaning the cloth of a uranium filter at the West Rand Consolidated Mine, South Africa

Chemicals as By-Products of Metal Mining

The spectacular progress of the chemical and plastics industries is providing mining companies with new and expanding markets for virtually all metals and minerals. These markets are discussed in the following article.

Since 1948, the output of the chemicals group of industries in the U.K. has been growing roughly twice as fast as manufacturing output as a whole. Prominent in this rapid expansion has been plastics, production in the first half of 1955 (162,000 tons) being at least double that of five years earlier. Further large expansion schemes are under way, particularly for P.V.C. and polythene. On the inorganic side, the main new developments in 1955 were the coming into operation of two large sulphuric acid plants, based on indigenous materials, with a combined capacity of 260,000 tons a year, and a similar quantity of cement. In the first eleven months of 1955 chemicals exports were valued at £213,000,000, compared with £183,000,000 and £162,000,000 in the corresponding periods of 1954 and 1955.

The part played by industrial and fuel minerals in the chemical industry is well-known, but the extent to which this rapidly growing market is contributing to the expansion of metal mining is perhaps less generally realized. Almost all metals are used in making chemical compounds and salts, either in pure form for analytical and specialized purposes, or as commercial chemicals such as copper sulphate, which is an important insecticide. Lead metal and zinc metal are converted into oxides to provide pigments for the paint industry, while titanium ores are the source of the pigment, titanium white. It has recently been announced that an £8,000,000 plant for the manufacture of titanium dioxide is to be built in Germany by the Bayer Chemical Works, while Canada's first titanium pigment plant, costing \$15,000,000, is being constructed at Varennes, Quebec. Parallel developments are taking place in other countries, including the U.K.

THE CANADIAN SCENE

An illuminating survey of the production of chemicals as by-products of Canadian metal mining has recently been published.* Sulphur as the sulphide constitutes a very large proportion of Canadian metallic ores and provides an enormous potential resource for chemical manufacture. The largest consumers of sulphur in the Dominion are the pulp and paper, fertilizer, and heavy chemical industries. In 1953 these three industries accounted for over 98 per cent of the total sulphur consumed, which amounted to 543,000 s.tons. To meet this demand large tonnages of sulphur are imported from the U.S. Over the years, however, an increasing amount of sulphur requirement has been met by utilizing the enormous domestic sulphur potential occurring in the form of sulphide ores. The most important aspect of this development has been the recovery of the sulphur content of smelter gases. In 1954 Canada's total production of sulphur reached 503,237 s.tons, of which 225,000 tons was recovered from smelter gases. In the same year sulphur imports fell to 310,127 tons compared with 390,330 tons in 1950.

In 1930 Consolidated Mining and Smelting Co. completed a plant with a daily capacity of 336 tons of sulphuric acid to utilize the sulphur content of fumes which were escaping into the atmosphere and causing pollution. To-day this plant has a daily capacity of 1,200 tons and is the basis of a valuable fertilizer industry. Since 1928 Canadian Industries Ltd. has recovered sulphuric acid from the stack gases produced in INCO'S nickel-copper operations at Copper Cliff, Ontario. In 1954 approximately 65,000 tons of sulphuric acid was obtained from this

source. Within the past two years INCO has developed an oxygen flash smelting process for the treatment of copper concentrates. This process produces a high quality furnace gas in which the SO₂ content is very much higher than in normal furnace or smelter gases. The gas is sold to Canadian Industries Ltd., and is processed to recover the SO₂ in liquid form. In 1954, approximately 70,000 tons of liquid SO₂ was produced and moved by tank cars to numerous pulp and paper companies in Ontario.

IMPACT OF NEW PROCESSES

The development of new chemical-metallurgical processes for metal recovery has resulted in the co-production of chemical products. For example, ammonium sulphate fertilizer is the end product of the Forward Ammonia Pressure Leach process, employed by Sherritt Gordon Mines. The process consists in leaching nickel sulphide concentrates with ammonia under pressure. This reaction leads to dissolution of the nickel sulphide, resulting in a substantial recovery of chemical fertilizer along with the main products, metallic nickel and cobalt. A new ammonia leach process developed by INCO will also result in recovering the sulphur content of the ore in the form of by-product chemicals.

In Australia, too, the increasing use of sulphuric acid is bringing pyrite resources into increasing prominence. The pyrite mine at Nairne, South Australia, is now producing and delivering mineral to the Port Adelaide acid plant; gases from the updraught sintering plant at Port Pirie will be used for acid manufacture, while both Mount Morgan and Mount Lyell are selling increasing quantities of pyrite.

In the Union of South Africa the expansion of uranium production has led to a very large increase in the output of sulphuric acid, which is used for leaching uranium oxide from gold mining residues. Almost all the raw material is derived from the gold uranium ores. In 1955 the production of sulphuric acid from this source amounted to 391,000 tons with an estimated value of £1,100,000, compared with 253,000 tons in 1954.

Apart from the materials used in its own manufacturing processes, the chemical industry is, of course, a very large consumer of metals in the form of special constructional or cladding materials for plant and equipment—e.g., stainless steel, silver and platinum. The chemical and oil industries have become by far the largest consumers of platinum, which is the most generally corrosion-resistant of all metals and alloys available to the designer of chemical plant and is therefore employed where extremely corrosive materials are to be handled or where the purity of the end product is of great importance. Typical applications of platinum-lined equipment include autoclaves for the manufacture of ethylchloride and tubes for vapour phase reactions with halogen acids at high temperatures. Platinum also serves as a catalyst in a great number of processes, the most widely known being in the production of sulphuric acid.

According to Mr. Ward W. Winkler, assistant manager of market development, Titanium Metals Corporation of America, large quantities of titanium metal are now going to the chemical industry, which will be one of the major tonnage users of the future.

* By W. R. McClelland, Head, Mineral Economics Section, Mineral Resources Division, Mines Branch, Ottawa (*Northern Miner*, Annual Review of 1955).

Flexible Tubing for Mine Ventilation

A new flexible tubing for ventilating new workings and headings in mining operations has just been announced by the Fabrics and Finishes Department of the Du Pont Co., United States. The new material has been under development since 1952, and a perfected version, called Ventube 5740 flexible ventilating tubing, is in excellent condition after two years' service at the Butte, Montana, operations of the Anaconda Co. The new tubing is described below.



The portable Ventube flexible tubing can be installed by one man

The tubing is constructed of a special nylon fabric impregnated and then coated on both sides, with neoprene. While this combination has long been recognized as desirable for ventilation tubing, extensive research was required to produce a satisfactory bonding.

The new Ventube is expected to be used chiefly in auxiliary systems where its flexibility, lightness, and convenience make it a logical choice for ventilating new headings. During blasting operations, the tubing can be unhooked from the suspension wire and pulled back from the blast area, then quickly returned to operation to clear fumes and dust from the new working face. Flexibility and lightness make installation a simple operation. An unskilled worker can easily set up new systems at the rate of more than 100 ft. per hr. Similarly, one worker can easily instal Ventube 5740 flexible ventilating tubing in narrow, winding corridors where space would make it difficult for two men to work as a team, but where ventilation is particularly important.

The flexibility of the new tubing decreases friction and



The tubing withstands pressure from main blower supplying air during tunnel construction

delivers more air to the place where it is needed. Elbows may be obtained for changes in direction of 90 deg. or more, but in most cases, the straight Ventube permits direction changes which might require, in metal ductwork, fairly complicated and expensive installations.

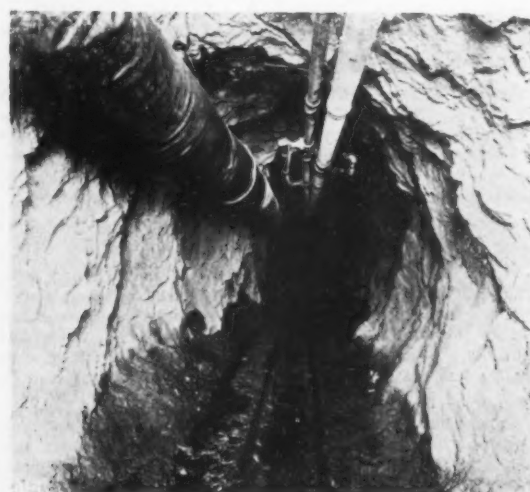
Because of the construction of the nylon fabric base, tear strength is unusually high, in both warp and woof. Tear trapezoid is 54 x 54 lb. As a result punctures produced by flying rock during blasts, for instance, are limited to the size of the fragment, instead of extending longitudinally. Patching is extremely simple and can be completed without removing the damaged section from the line.

Although designed primarily for use in auxiliary installation systems, the new Ventube is being use-tested as a replacement for metal ducting in a metal mine in the United States.

Laboratory data on Ventube 5740 reveals tear trapezoid to be 54 x 54 lb.; porosity resistance, 1.25 lb. per sq. in.; hydrostatic, 200 lb.; and weight, 13.5 oz. per sq. yd. (25 ft. length of tubing weighs 12 lb.).



Ventube clearing the air immediately after blast



A semi-permanent installation of the flexible tubing

TECHNICAL BRIEFS

Thawing Out Frozen Coal

The difficulty of unloading frozen coal and ores has long presented a serious problem for railways and for large users such as the steel industry and public utilities. Promising results are expected from a process tried out recently at the Lakefront docks in Toledo, Ohio, in which frozen coal is thawed out by infra-red rays.

Infra-red heating units were originally developed by late Gunther Schwank, a German engineer. During the past five years they have been widely used on the European Continent for economically heating open-air cafes, churches and cathedrals, and industrial plants. They are manufactured in the U.S. by the Perfection Industries division of Hupp Corporation, Cleveland, which staged the demonstration.

Railway men have tried a variety of methods for thawing coal and ore, including dynamiting, passing the trucks through coal fires laid alongside the tracks, and warming the sides of the trucks with torches. Last year the Lakefront management spent \$100,000 on a system of oil burners and torches, which almost doubled the speed of unloading frozen materials.

In the latest method the truck is run between two banks of infra-red units. Natural or artificial gas is piped into the units. The gas burns at the face of small ceramics and gives off infra-red heat. If the process fulfils expectations it will halve the time at present needed to thaw out frozen coal. It can be operated more cheaply than the oil-burning method and will avoid searing the sides of the car, as has happened with oil burners.

British Standards for Aluminium Alloys

In 1949 the British Standards Institution issued B.S.1490, which represented the first systematic series of specifications for ingots and castings for general engineering purposes in aluminium and its alloys to be published in the U.K. The great advances in aluminium technology during the past few years necessitated a revision of this standard to bring it more into line with the present position of alloy development and usage. After considerable work a new edition of B.S.1490, adequately reflecting the present state of industrial usage, was issued at the end of October, 1955.

Aluminium-magnesium-silicon heat-treatable wrought alloys are widely used throughout the world for structural and general purposes. In B.S. 1470-1477, published between 1948 and 1951, this type of alloy was designated H10. As a result of practical experience and research it has been more precisely defined in the revised British Standards 1470-1477 issued last year. Three alloys are now standardized, namely H10, H.20 and H.30. All these alloys have high general resistance to corrosion, and all are weldable by modern shielded-arc processes. For many purposes any of the three may be used, but each may have advantages in particular applications.

Leaflets describing the changes incorporated in the 1955 revisions of B.S. 1490 and B.S. 1470-77 are issued without charge by the Aluminium Development Association, 33 Grosvenor Street, London, W.1. A revised edition of the A.D.A. Information Bulletin No. 2, "The Properties of Aluminium and its Alloys," has recently been published.

Gold as Cladding Material for Reactors

To the growing list of nuclear metals can be added gold, which was used as a protective cladding in the two versions of relatively low power homogeneous reactors known as the Los Alamos Power Reactor Experiments. These reactors were described in a paper presented to the International Conference at Geneva last year by Darol Froman, R. P. Hammond, and L. D. P. King.

Both reactors use phosphoric acid solutions of uranium, though at different acid concentrations, and in both the heat exchanger for removal of power is enclosed in the same pressure vessel as the reacting fluid. In both reactors corrosion is prevented by using gold covering for the structural metals in contact with the solution and both are operated at sufficiently

high temperatures to cause automatic recombination of the radiolytic gases. The many internal, rather complicated shapes are covered by gold plating, exceptions being the heat exchanger tubing which is gold clad by means of a drawing technique, and the control rod thimbles which are clad with platinum because the neutron capture in gold would reduce the effectiveness of the rods. In view of the difficulty of obtaining gold plating completely free of pinholes, the authors of the paper suggested that other techniques of covering might be necessary to obtain long, corrosion-free life of the reactor.

It was later found possible to keep uranium in solution in the form of U^{++++} in the high concentration phosphoric acid under a reducing atmosphere of hydrogen. The vapour pressures encountered with this fuel solution at operating temperatures of 350 deg. C to 450 deg. C are 40 or 50 kgm. per cm², rather than about 250 as observed with the weaker acid. This means that pressure vessels can be built with much thinner walls and the gamma-ray heating effect in the walls becomes relatively unimportant. Also in this reducing atmosphere silver is perhaps more resistant to corrosion than is stainless steel in the oxidizing atmosphere. Consequently gold plated silver coatings and, of course, pure gold cladding, form good protective coats.

Arc Welding Titanium

The U.S. Bureau of Mines started research on the arc welding characteristics of titanium in 1948. Little was then known about the art except that the easily contaminated metal required more protection from the atmosphere during welding than most other metals. Chambers were designed and built within which titanium could be welded with adequate inert gas protection. Welds were made and their properties studied, and prototype items were made successfully. Bureau of Mines Report No. 5178, presenting a resumé of these experiments, indicates that the process is successful if conducted under proper conditions and describes the welding of prototypes.

Falls of Roof

The two most serious hazards from the standpoint of frequency and severity of injuries to mineworkers are roof falls and haulage. Roof falls caused 55 per cent of all fatalities in U.S. coal mines in 1954.

Roof bolting has proved its effectiveness in preventing roof-fall fatalities and continues to gain wide acceptance. During 1954, 120 underground mechanized coal mines in the U.S. used roof bolts exclusively and 26 per cent of the entire production of bituminous-coal mines was mined in roof-bolting areas. Significantly, of the 177 roof-fall fatalities that occurred in bituminous-coal mines during 1954, only two resulted from failure of bolts to support the roof.

Three Bureau of Mines technical publications intended to aid mining engineers in designing roof-bolting systems have been released by the Department of the Interior. R.5154 ("Theory of Model Testing as Applied to the Roof Bolting") describes procedures used in subjecting models of bedded mine roof to increasing strains in a centrifuge. Special gauges made it possible to determine the maximum safe strain or load for a model, using various roof-bolting patterns, without destroying the model. R.5155 ("Design of Bolting Systems to Reinforce Bedded Mine Roof") presents roof-bolting design formulae developed by combined theoretical and experimental methods, and a chart to facilitate their use. These formulae are applicable to a wide range of conditions. Spacing bolts closer along an opening than across it is recommended to increase effectiveness and reduce costs. R.L.5156 ("Principles of Reinforcing Bedded Mine Roof with Bolts") confirms the theory that roof bolts bind together the layers of bedded mine roof to form a single strong beam instead of a succession of weak ones. It concludes that bolts, to be effective, must be tightened when installed and must remain in tension thereafter. To minimize initial sagging, they should be installed as near to the face as possible.

MINING MISCELLANY

The International Machine Tool Exhibition, 1956, will be held in Olympia, London, from June 22 to July 6 inclusive.

The second World Metallurgical Congress will take place in the U.S. in October and November, 1957.

A two-year agreement has been signed between the U.S. and Chile for a joint exploration programme which will search for radioactive minerals in Chile.

A mobile rock crushing and screening plant has been shipped to the Gold Coast for the Crown agents by the Glasgow firm of Keir and Cawder.

The discovery has been reported from Jaen, in Spain, of a mercury deposit near Siles in the Sierra del Calderon and of a deposit of both silver and lead outside the town of Tobarejo. No further particulars are yet available.

A Court at Patna has ruled that the State of Bihar is bound, not only in law but also in justice, equity and good conscience, to renew the lease of the British-owned India Copper Corporation for mining kyanite in Kharaswan.

A severe shortage of professional and technical staff is referred to by the Director of the Gold Coast Geological Survey in his report for 1954-55. At the end of March, 1955, 13 out of 20 posts of geologist were vacant. Every possible effort was made to train African staff for all grades.

Having bought out the Bank of Chios, the International Import-Export Corporation, an American company, has acquired control of the Atlanta Iron Mining Company, owner of the richest iron ore deposits in Greece, which are conservatively estimated at 10,000,000 tons.

Palawah Quicksilver Mines, Inc., has purchased a second Gould rotary kiln for its mercury mine in Palwan Island, Republic of the Philippines. The kiln was scheduled for shipment from San Francisco early in May and is expected to be in operation by mid-1956. The company is exporting mercury to Japan.

The annual report of the Surinam Bauxite Company for 1955 states that in the early part of the year production was on the low side, but it was increased so greatly in subsequent months that the total output for the year almost equalled the record figure for 1954. Exports for 1955 totalled 2,544,504 tonnes of bauxite. Though sales to the U.S. have been declining considerably in recent months, results for the coming year are expected to be satisfactory.

As part of the programme of the Geological Survey of Great Britain, an airborne magnetometer survey is to be conducted over East Anglia and south-east England and flying will start at the beginning of June. The contract for the work has been awarded to Hunting Geophysics Ltd., who will use a Hunting Percival Prince twin-engined aeroplane. Decca instruments in the aircraft will be continuously photographed and will be used for fixing the position of the aircraft over the sea. The total area to be surveyed is 12,200 sq. miles.

A revival of interest is reported from Canada in columbium and lithium minerals, substantial deposits of which have been found in the Dominion during recent years. U.S. interests, believed to include a leading motor car manufacturer, are reported to be negotiating with the Coulee and Headway Lake mining concerns, both of which hold columbite prospects. Operations in Beaucage Mines' lithium occurrences may be stepped up as a result of recent negotiations, also with U.S. companies.

At a meeting in Rome of the Belgo-Italian Mixed Commission set up to implement the protocol governing the emigration of Italian workers to Belgium for work in the coal mines, the Italian authorities were reported to be insisting on stricter security measures in the Belgian mines and the appointment of Italian representatives to certain control services. Differences about wages and the classification of pits were also said to be causing difficulties. The High Authority of the European Coal and Steel Community has informed the Belgian Coal Mining Federation of a decision to extend the scope of its current inquiry into production costs of certain mines in the Liege and Charleroi area to cover the production costs of the Belgian coal mining industry as a whole.

A World Bank Mission has concluded that an industrial credit and investment company is required for Pakistan. It is proposed that this company should stimulate and assist in the creation of private industry by making equity investments as well as loans and by underwriting and distributing securities. Its investments will be diversified geographically and by types of industry.

PERSONAL

Mr. L. E. Langley has been appointed a director of St. John D'El Rey.

Mr. Frank Holmes has been appointed as chief purchasing officer of Hadfields Limited.

Dr. R. A. Wilkins, vice-president, research and development, Revere Copper and Brass, Inc., Rome, N.Y., U.S.A., has been elected a Fellow of the Institute of Metals in recognition of his outstanding services to the Institute, in particular as corresponding member to the Council in the U.S. He is the first member resident outside the British Isles to be elected to the Fellowship.

Owing to increasing pressure of work, Mr. N. K. Kitto has resigned from the secretaryship of the Cornish Mining Development Association, which he had held for six out of the eight years of the Association's existence. Mr. Leonard G. Brown has been elected hon. general secretary, while Mr. Kitto has been elected to the seat on the Executive vacated by Mr. Brown.

Mr. R. Appleby, director and general manager of Black & Decker Ltd., has been appointed director of international operations to the parent company (Black and Decker Manufacturing Co.) at Towson, U.S.A. Mr. John W. A. Meredith has been appointed export sales manager of the British company. He was previously the company's representative in the Far and Middle East. Considerable extensions to the factory at Harmondsworth have just been completed.

At a recent meeting of the Executive Committee of the Cornish Mining Development Association, the question of affiliation with the United Kingdom Metal Mining Association was discussed at length. It was unanimously agreed to seek affiliation and that a representative should be appointed to sit on the Taxation Committee of the U.K.M.M.A., as suggested by the latter body.

AGENCIES WANTED

The American Rubber Co. N.V., Fregatstraat 103-107, Utrecht, are interested in representing U.K. manufacturers of centrifugal and plunger pumps for water, oil and chemicals. Manufacturers interested in this inquiry should write direct to the company. They are asked at the same time to notify the British Embassy, Commercial Department, Lange Voorhout 32, The Hague, that they have done so. B.O.T. ref.: E.S.B./11771/56. Telephone inquiries to Chancery 4411, extension 776.

CONTRACTS AND TENDERS

Greece

TEN/19302. Main project for development of the lignite mines at Ptolemais (Northern Greece)—mining installation, briquette factory, coking plant and small power plant. A copy of the German text of the specifications may be inspected at Room 805, Lacon House, Theobalds Road, London, W.C.1. till May 19, after which it will be available for loan to U.K. firms. Interested firms should submit offers to Mr. Costas Georgandas, managing director of the contracting firm, Ptolemais Lignite Mining and Industrial Co. Ltd., 8 Dragatsaniou Street, Athens, who is instructed to submit offers to the Greek Ministry of Industry by 23/6/56. If this does not allow sufficient time he is prepared to negotiate for extension B.O.T. ref.: E.S.B./28767/55. Telephone inquiries to Chancery 4411, Extension 738 or 771.

India

TEN/19253. Supply and installation of a central coal preparation and coal cleaning pilot plant comprising 20/tons/hr. drum type heavy medium separator and 20 tons/hour baum jig. Sealed tenders in triplicate should be addressed to the Director, Fuel Research Institute, P.O. Jealgora, Dt. Manbhum. Closing date, 31/7/56. B.O.T. Ref.: E.S.B.11972/56. Telephone inquiries to Chancery 4411, Extension 738 or 771.

METALS, MINERALS AND ALLOYS

COPPER.—Copper has been an uneventful market in the United States in the past week. The big producers' price remained at 46 c. per lb., the custom smelters have kept theirs at 45 c. There were reports for a time of custom copper at 46 c. but it was generally felt to be an isolated case of a consumer unexpectedly short of prompt metal. The only source of strength for the market was the announcement that General Services Administration was authorized to begin negotiations for the repayment of about 40,000 tons of diverted copper. This statement caused a reversal of the decline in London, but the tide turned again on the realization that this was inevitable and expected anyway, and on the news of further cuts in American automobile output. The suggested schedule for repayment is as follows: 1956 third quarter 7,600 tons; fourth quarter, 11,200 tons; and for the four quarters of 1957, 9,800, 6,200, 2,300 and 1,900 tons. No doubt this rate would be amended in the event of a strike in the American industry. Meanwhile, consumers are staying out of the market if they can and are awaiting the outcome of the wage talks in the industry. This means that the future positions that would normally help to indicate demand are being ignored. No. 2 scrap copper is being quoted at around 35 to 35½ c.

Members of the African Mineworkers' Union have balloted overwhelmingly (4,154 to 22 according to the president, Mr. Katilungu) in favour of a strike in their dispute at Mufulira. The dispute is over the continued employment of a senior official in the African personnel department to whom the African union objects. The threat to strike is not being taken seriously as yet.

A joint statement by the Australian Ministers of Trade, and National Development, announces that the Cabinet has decided to retain all present tariff protections on basic copper such as blocks and ingots and to continue the concessional admission of such basic copper as may be required to supplement local production. Existing controls on basic copper and copper products for export would continue. The statement added that if the price for imported copper fell appreciably the Tariff Board would consider what assistance should be given the local industry. Copper output in Australia was said to be about 40,000 tons and she would in time become a net exporter of copper.

April output of crude copper in the United States was 108,985 tons against 112,277 in March. Output of refined copper was 140,032 tons against 144,027 in March. Domestic deliveries were down to 139,927 tons from 141,590 but stocks rose from 51,595 to 54,887 tons.

April output of refined copper outside the United States was 114,430 tons against 114,435 a month earlier.

Mr. W. A. Richardson, head of Mogul Mining Corporation, which controls the subsidiary operating Avoca Copper Mine, has stated that tests have shown that it is impossible to double the forecast extraction rate of 4,000 tons of ore a day. He added that mining proper would begin next year. Meanwhile, drilling operations have begun at Beaubarc and will shortly begin at Allihies.

Mr. Roy Glover, chairman of Anaconda, has said that the company has approved expansion plans over the next five years with an expenditure of \$384,000,000. Expenditure in this period on plant and properties would exceed the expenditure of the past ten years; and in the fifteen years taken together the investments would exceed total book value of all Anaconda's properties at the end of World War II. He said, "we can confidently look forward to a longer and greater future of Butte's glorious history as a mineral producing area" and added that the new copper laws in Chile had created a more favourable climate for investment.

LEAD.—Lead has been, like zinc, a quiet market at 16 c. per lb. New York although there is no sign of the price giving way. Demand is patchy and no more than routine and sentiment is not helped by the prevailing weakness in Europe which constantly threatens a heavier flow of foreign metal. The recent weekly sales of 3,136 tons was the slackest for several months past.

TIN.—The sudden upward movement in the price of tin in New York on the news of a lightning strike at Penang was reversed when the strikers returned to work after 24 hours. Thereafter the market has been steady with some modest consumer demand apparent in the last day or so. There was a report during the week that American Can Company had perfected a process for tinplating only narrow margins of steel plate that form soldered side seams of the cans. This process was reported to reduce the tin required for canning by 98 per

cent. The news—at first sight startling—had no effect on the market. These reports have been coming out quite regularly, for one thing; for another the process, even if adopted, will not have any effect on tin demand in the immediate future; and finally there are more immediate things for tin dealers to study. The most important of these is the chance of a strike in the steel industry which is regarded as a distinct possibility. The market must also take note of the course of Singapore's constitutional development talks between Mr. Marshall and the British Government. The talks broke down early this week as accounts of the course of the talks, relayed back to Singapore, forecast they would. However, within 24 hours of this announcement, Mr. Marshall said that he would make a new approach to the problem. The chances of lawlessness in Singapore if the talks are fruitless are considered strong and the tin market must watch their course anxiously.

Indonesia has now formally deposited the instrument of ratification of the International Tin Agreement in London. The next step is for the British Government to call a meeting of all ratifying powers in London. For administrative reasons it would be convenient to officially start the I.T.A. at the beginning of the month and it is therefore thought likely that an attempt will be made to get the machinery working by July 1.

ZINC.—The price of zinc has remained unchanged in the United States at 13.50 c. per lb. for prime western grade East St. Louis. The undertone of the market has been lifeless and dull in spite of the continued strike at two plants of New Jersey Zinc Co. The news of the further cutbacks in the automobile industry must now make the producers uncomfortable. The hope of the producers has been that they could hang on till a revival in automobile output improved demand. Of course it was never thought that any great recovery could be expected before the 1957 models make their appearance; but it was hoped nevertheless that there would not be need for further cutbacks. The industry has seen its fortunes reversed in a little over a year. When producers were still shipping all the prime western grade that they could to the stockpile they were faced with an insatiable demand for special high grade; now that special high grade has a much less than routine demand the deliveries of galvanized sheet are found to have reached a record level in March of 291,193 s.tons. But although the producers are having a rather thin time and watching a strong inflow of foreign metal it remains a fact that if the revival of automobile output (which seems bound to come in the third quarter) is superimposed on the existing demand for zinc for galvanizing the zinc producers will be able to smile again. However, the present slackness and the consequent higher rate of delivery to the stockpile suggests an interesting problem. It is thought that the stockpile will need only another 80,000 tons in the second half of the year to reach its goal of 300,000 tons. The goal will be sufficiently near (though it is unlikely to be reached) for the mining industry to ask the parties what they think it needs in the way of protection before the presidential election. Metaliferous mining protection may yet become a minor election issue.

ALUMINIUM.—Though making less spectacular advances than in North America, the aluminium industry in Europe is being steadily expanded. According to the Aluminium Centre in Dusseldorf, European production may rise this year to 620,000-630,000 tons from 544,500 tons in 1955. This increase is only likely to be achieved however, if Norway's production is not hindered by shortage of electric power. Hitherto, the expansion of Norway's hydro-electric power, though rapid, has failed to keep pace with the growing requirements of aluminium production and other industries. Installed primary aluminium capacity in Norway is in the region of 95,000 tons, but 25,000 tons were lost last year due to shortage of electric power following an unusually dry season. Expansion of hydro-electric capacity will be accelerated as a result of a loan of \$25,000,000 which the World Bank has recently granted for this purpose. Although ranking only fifth in importance as a world producer, Norway is the second largest exporter of primary aluminium. In the course of the next five years its aluminium industry hopes to add 65,000 tons of new capacity, increasing the potential to about 160,000 tons. Having regard also to the rising outputs of West Germany, France, Austria and other producing countries, it is evident that the expansion of European production will make a significant contribution towards the gradual amelioration of the tight international supply position.

BAUXITE.—The U.S. House of Representatives has passed

a Bill to suspend for two more years, until July 16, 1958, the import duties on crude and refined bauxite. The House Ways and Means Committee reported that bauxite was vital to the U.S. aluminium, steel and chemical industries and that the U.S. was depending more and more on imported bauxite supplies.

BISMUTH.—It is understood that bismuth is being used to some extent for atomic energy purposes, but as yet there is no indication as to the probable effect of this new demand on world markets. The quoted market price of metallic bismuth in New York remained throughout 1955 at \$2.25 per lb. lots, having been unchanged since September 5, 1950. In Britain bismuth is quoted at 16s. nominal per ton lots, ex-warehouse. World production was estimated to have been virtually unchanged last year at 1,900 s.tons.

COLUMBIUM.—Fabricated columbium has been developed by Murex Limited on behalf of the British Atomic Energy Authority and is on sale by the company on a limited scale. Columbium's best known application is as an alloy addition for stainless steel and as a constituent of high temperature alloys. Important uses for pure columbium rod, sheet wire and tube have now been found as reactor fuel elements in the production of atomic energy. Examples of these products were on view in the Birmingham Section of the British Industries Fair. Accles and Pollock, Ltd., are reported to have collaborated in the production of columbium tube.

MAGNESIUM.—Discovery of magnesium salt in the Quill Lake area of Saskatchewan by Potash Company of America has resulted in an agreement between the company and the Province for the development and production of the salt. This is reported to be the first agreement of its type in the history of Saskatchewan. The agreement is for ten years, during which an annual rental of \$10,000 will be paid. During this period the company will study various aspects of the mining and sale of magnesium and conduct any other work that may be necessary to determine the feasibility of establishing a magnesium industry in the Province.

NICKEL.—In order to ease the pressure on available supplies, Mr. Arthur Flemming, Director of ODM, has ordered the diversion from delivery to the U.S. national stockpile to private industrial use of 20,000 s.tons of nickel, half of which is to be diverted in the third quarter and the balance in the fourth quarter of this year. ODM had already diverted a total of 17,150 tons from stockpile delivery to industrial use in the first and second quarters.

Mr. Flemming also stated that he was considering a proposal for "an expansion programme for nickel" and would announce his decision shortly. It is understood that the proposed programme would be aimed at increasing present U.S. supplies of nickel from 30 to 50 per cent. Fast tax write-offs would be given to U.S. companies to expand their producing facilities. Canadian and Cuban producers also would probably be offered inducements to expand their nickel output. The objective would be to supply American requirements, an expansion programme of this magnitude would presumably have favourable repercussions on the supply position elsewhere. The present expansion goal for nickel is 190,000 s.tons a year. It is hoped that the plans now under development by Bethlehem Steel and Freeport sulphur for producing nickel from low-grade Cuban ore will increase supplies to the U.S. by some 50,000 tons a year, assuming that the process proves successful. Falconbridge is investigating the possibilities of lateritic nickel silicate ore in the Dominican Republic—a development which reflects the increasing interest in the potential recovery of nickel from such ores on a commercial basis.

The London Metal Market

(From Our Metal Exchange Correspondent)

Since the last report the copper price has had to withstand the shock of additional evidence that the motor industry in the U.S. is unlikely to recover before the new models appear, and also the arrangement that metal which has been diverted from the stockpile shall be returned over a relatively long period. These two factors resulted in a sharp fall in the quotation, but this has not been as severe as some people expected and the main point of discussion now is whether the market is on the verge of a further substantial decline or whether another technical recovery is due: opinions are about equally divided with perhaps the majority being on the side of a further decline.

There is no doubt that consumer demand is not as good as it has been, but it is thought that purchases during the last few weeks have been below actual requirements and that therefore a demand is being built up which will make itself felt and should have a steadying influence on the market. In America

prices are maintained with no indication that any change is likely in the near future, and this fact should also make for stability.

The tin market has been featureless with the ups and downs in price corresponding to the news about the labour situation in Penang. Consumption remains good but there is little reason to expect an advance in price on this basis alone. On Wednesday it became known that the Indonesian government had at last deposited with the British Government the instrument of ratification of the International Tin Agreement, and this means that the officials of the Agreement are now free to set up their organization with a view to being ready to commence operations. On Thursday morning the Eastern price was equivalent to £768½ per ton c.i.f. Europe.

Both the lead and zinc markets appear to have become stabilized around their present levels, and the majority cannot foresee any radical change until tonnages in America offered to the stockpile become very much greater than is at present the case. In spite of the troubles in the U.S. motor industry demand for both metals remains satisfactory, and it may prove that the abnormal demand from that industry was the major cause of the very high prices reached: now that consumption has returned to what is probably a normal level, quotations for both lead and zinc should also remain reasonably stable at to-day's figures which must be acceptable to all concerned.

Closing prices and turnovers are given in the following table:—

	May 10		May 17	
	Buyers	Sellers	Buyers	Sellers
Copper				
Cash	£350	£351	£341	£341½
Three months	£343½	£344	£331	£331½
Settlement	£351		£341½	
Week's turnover	5,325 tons		8,125 tons	
Tin				
Cash	£752	£754	£753	£754
Three months	£751	£752	£753	£755
Settlement	£754		£754	
Week's turnover	750 tons		685 tons	
Lead				
Current half month	£111½	£111½	£111½	£112½
Three months	£109½	£110½	£110½	£110½
Week's turnover	4,850 tons		3,025 tons	
Zinc				
Current half month	£95½	£96	£94½	£95½
Three months	£93½	£94½	£92½	£93
Week's turnover	4,250 tons		4,125 tons	

OTHER LONDON PRICES — MAY 17

METALS

Aluminium, 99.5%, £189 per ton	Nickel, 99.5% (home trade) £519 per ton
Antimony—	Osmium, £24/27 oz. nom.
English (99%) delivered, 10 cwt. and over £210 per ton	Osmiridium, nom.
Crude (70%) £200 per ton	Palladium, £8 0s./£8 10s. oz.
Ore (60% basis) 23s. 6d./24s. 6d. nom. per unit, c.i.f.	Platinum U.K. and Empir: Refined £34 0s. oz. Imported £38 0s./£39 0s. oz.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Rhodium, £40/£42.
Cadmium 12s. 0d. lb.	Ruthenium, £16/£18 oz.
Chromium, 6s. 11d. lb.	Quicksilver, £85 ex-warehouse
Cobalt, 21s. lb.	Selenium, 112s. nom. per lb.
Gold, 249s. 1½d.	Silver, 78½d. f.o.z. spot and 78½d. f.d.
Iridium, £29/31 oz.	Tellurium, 15s./16s. lb.
Manganese Metal (96%-98%) £269 according to quantity	
Magnesium, 2s. 4d. lb.	

ORES, ALLOYS, ETC.

Bismuth	60% 8s. 3d. c.i.f.
.. .. .	30% 5s. 0d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semi-friable) 48% ..	£15 15s. 0d. per ton c.i.f.
.. Refractory 45% ..	£14 15s. 0d. per ton c.i.f.
.. Smalls 42% ..	£12 15s. 0d. per ton c.i.f.
Magnesite, ground calcined ..	£28 0s./£30 0s. d/d
Magnesite, Raw (ground) ..	£21 0s./£22 0s. d/d
Molybdenite (85% basis) ..	8s. 2½d. nom. per lb. c.i.f.
Wolfram and Scheelite (65%) ..	264s. 0d./269s. 0d. c.i.f.
Tungsten Metal Powder (98% Min. W.) ..	21s. 0d. nom. per lb. (home)
Ferro-tungsten (80%-85%) ..	18s. 0d. nom. per lb. (home)
Carbide, 4-cwt. lots ..	£39 3s. 9d. d/d per ton
Ferro-manganese, home ..	£66s. 0d. per ton
Manganese Ore Indian	
Europe (46%-48%) basis 125s. freight ..	102d./105d. per unit c.i.f.
Manganese Ore (43%-45%) ..	97d./98d. per unit c.i.f.
Manganese Ore (38%-40%) ..	90d./92d. per unit
Brass Wire	3s. 3½d. per lb. basis
Brass Tubes, solid drawn ..	2s. 7½d. per lb. basis

production—notwithstanding increased production during the year ended December 31, 1955—was received with great satisfaction. Moreover, Sir Ernest confidently expects sales of gems during 1956 to continue at "the high rate" achieved in recent years.

Any long term forecast for sales of industrial diamonds, must, of course, depend greatly upon U.S. stock-piling policy. But as these purchases, says Sir Ernest, will continue anyhow during 1956 a satisfactory year's trading is foreseen. It must be remembered, however, that when stock-piling buying ceased, De Beers would be faced with over-production. Additional outlets must, therefore, be found. And in this respect the company continued to take the lead in research for wider usages of industrials.

De Beers total group assets at December 31, 1955, expanded to £139,098,339 from £126,327,374. Current assets of £48,530,657, including government securities with a market value of £8,595,761, compared with current liabilities and provision for taxation of some £21,000,000. Group quoted investments shown on the balance sheet at £21,224,003 (£15,396,798) had a market value of £23,252,734 (£22,183,845). Diamonds on hand at cost of production or market value, whichever was lower, amounted to £5,546,684 compared with £4,064,546. Sir Ernest Oppenheimer is chairman. Meeting, Kimberley, June 6.

Fall in African and European's Investment Values

An interesting comment contained in Mr. T. Coulter's review of African and European Investment Company's financial year ended December 31, 1955, concerned the Jeanette Gold Mining Company situated in the northern Orange Free State. Although some encouraging features had emerged from recent development at the neighbouring Loraine and Freddie's Consolidated mines, difficulties encountered by these companies, together with current problems of raising further capital, had brought about the decision to suspend operations on the Jeanette property.

The mine had since been placed on a caretaker basis.

African and European's consolidated balance sheet at December 31, 1955, showed total assets at £12,134,895 against £12,560,270 previously. Current assets of £1,899,432 exceeded current liabilities and provision for taxation by some £150,000. Quoted investments shown on the balance sheet at £7,081,830 (£6,213,427) had a market value of £14,536,271 (£16,296,260). Meeting, Johannesburg, June 15.

Freddie's Cons. Obtains 544 in. dwt.

Sampling in 17 Haulage East at Freddie's Consolidated up to May 9 has revealed 1,630 ft. equal to 86 per cent of payable reef with an average value of 544 in. dwt. Uranium values found in conjunction with these gold results were also satisfactory. But very considerable further development footage, it was stated, would be necessary before the real importance of this area could be determined.

An improvement in the company's affairs was expected and future months should witness a drop in net outgoings to a rate of £25,000 monthly. Confidence that the company's remaining resources were being used to good purpose was re-affirmed. Funds, it was emphasized, were not being dissipated in carrying out a programme which had no possibility of ultimate reward.

Operations Resumed at Mawchi

As previously forecast by the chairman of The Mawchi Mines, Mr. Robert Annan, a resumption of small-scale operations took place during January, 1956. Results obtained during the quarter ended March 31 show that a total of 2,078 tons of ore were treated yielding 40.35 tons of tin-wolfram concentrates. Referring to future prospects the company emphasizes that peaceful and settled conditions have not yet been fully established in the mine area or along transport routes. Progress might, therefore, be slow until better conditions obtain.

Some time might elapse, it is stated, before it was possible to issue an official announcement regarding negotiations with the Government of the Union of Burma on the Joint Venture scheme. Talks were, however, proceeding in an atmosphere of goodwill.

Uncertain Political Outlook on the Gold Coast

Referring to present political conditions on the Gold Coast, Major-General Sir Edward L. Spears, chairman of Ashanti Goldfields Corporation, said that disturbances—even fighting and civil war—could not be ruled out. Although in such a

deplorable event the company was bound to be affected, there was certainly no hostility towards the industry. Yet General Spears' personal opinion was that major disturbances were not inevitable. He believed a settlement could and should be reached between the two opposing parties.

Sir Edward found it difficult to forecast what the repercussions of the recent strike of Gold Coast employees might be, or whether a more reasonable attitude could be now hoped for on the part of the Union. Yet events since the stoppage had provided grounds for hope that good relations would be restored and that no recurrence of this kind of trouble would take place. At the time General Spears left the mine even if the Union had wished to call another strike the men, he said, would not have come out.

Company Shorts

East Champ Will Not Utilize Full Uranium Plant Capacity.

Because of underground faulting, said the chairman of The East Champ d'Or Gold Mining Company, Mr. D. A. B. Watson, in his statement to shareholders, it would not be possible to stope at a rate sufficient to provide ore to satisfy the full 20,000 ton capacity of the company's uranium plant. Following an examination of the most economical production rate under the circumstances, it had been decided that the mine should be re-organized on a basis of milling of about 10,000 tons of Bird Reef ore monthly. At this rate of output maximum economies could be effected.

Government Areas' Large Pyrite Reserves.—At the meeting of Government Gold Mining Areas held recently in Johannesburg it was stated that sufficient material existed in the company's surface dumps to keep the pyrites plant operating for some 15 years after the closure of gold reduction plants.

Profits Should Improve at City Deep.—In response to shareholders' questions at the recent meeting of City Deep the chairman said that there was some hope of costs coming down and profits improving. Good values, he said, were being struck at depth and there was still hope that the mine would become a profit earner. When arrangements had been finalized, the use of money obtained through sales of land to the Johannesburg Municipality, would be considered. But the need for further capital expenditure would have to be borne in mind.

Higher Payment by Cons. Zinc.—A final dividend of 3s. per £1 share has been recommended by The Consolidated Zinc Corporation in respect of twelve months ended December 31, 1955. A total of 4s. 6d. per share will thus have been paid for the year on the £8,730,596 ordinary capital. This compares with only 3s. 9d. per share for 1954. The Corporation's net profit for the past financial year declined slightly to £2,344,928 from £2,383,378. A balance of £3,292,693 against £3,368,838 remained for appropriation. Meeting, London, June 18. Mr. J. R. Govett is chairman.

RECENT FINAL DIVIDENDS AND PRELIMINARY FIGURES

Name of Company	Year Ended	Final Dividend %	Net Profit after tax		Total Dividends	
			This Year £(000)	Last Year £(000)	This Year %	Last Year %
Globe & Phoenix	31.12.55	10	—	—	70	70
Halkyn Dist. a	31.12.55	37½	43.1	45.2	37½	25
H.E. Prop.	31.12.55	10	98.2	74.4	15	15
Burmah Oil b	31.12.55	12½	5,852.5	3,728.9	17½	21
St. John d'El Rey	31.12.55	Nil	Dr. 145.8	Cr. 54.2	Nil	24
Cons. Zinc c	31.12.55	15	2,344.9	2,383.4	22½	18½
New Brok. Hill	31.12.55	50	597.3	947.1	90	60
Lobitos Oil d	31.12.55	8	819.0	869.5	14	14

a After crediting £4,243 (£17,577) over-provided in previous years.

b 1955 divs. paid on doubled capital.

c 1954 interim on smaller capital.

d In addition to latest div., special distribution of 2% (same) made. Dividends for 1955 paid on larger capital.

RECENT INTERIM DIVIDEND ANNOUNCEMENTS

Company	Year Ended	Dividends %	Date payable	This Year to date	Total Last Year
Lake George	30.6.55	15	May 25	15	Nil
Pengkalen a	30.9.55	15	June 8	50	55
" b	30.9.54	25	June 8	35	d
Mt. Isa c	30.6.56	10	June 28	10	25
Int. Nickel e	31.12.56	65c.	May 22	65c.	3.75

a 4th interim.

b 2nd interim.

c Dividends expressed in Australian currency.

d Not yet established.

e U.S. currency per common share.



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DE BEERS CONSOLIDATED MINES LIMITED

(Incorporated in the Union of South Africa)

RECORD DIAMOND SALES IN 1955

DEMAND STILL OUTSTRIPS INCREASED PRODUCTION

The following extracts are from the statement by the Chairman, Sir Ernest Oppenheimer, D.C.L., which has been circulated with the annual reports and accounts: The Consolidated Profit and Loss Account shows that the Group Profit for the year, after providing £8,305,010 for taxation, was £21,055,711. The net profit attributable to your Company was £18,616,909 (£15,253,980 in 1954).

The Consolidated Balance Sheet showed total assets of £139,098,339. Included in this total was an amount of £15,545,060, being the net excess of cost of investments in subsidiary companies over their nominal value less amounts written off and after adjustment on consolidation. Against this excess, however, Capital Reserves totalled £40,336,827. Current assets, loans to other Companies and Investments totalled £92,599,862 and exceeded all liabilities to the public by £71,502,043 (£64,058,702 at the end of 1954).

In addition, the Group held a stock of diamonds valued at £5,546,684 on the basis of cost of production in the case of the Mining Companies and cost or market value, whichever was the lower, in the case of the Diamond Corporation, and a stock of Mining Stores and Materials valued at £1,582,279.

It will thus be seen that the Group has considerable financial reserves which, together with the £15,000,000 capital resources of the Trading Companies, not only provide a strong protection to the diamond trade under all foreseeable contingencies, but allow your Company to continue to play an important part in the mining and industrial development of the Country.

The Group has very valuable investments in varied undertakings not in any way connected with the diamond industry. An analysis of the Consolidated Balance Sheet discloses that the value of these investments, based on market price in the case of quoted securities and the book value of others, plus loans to concerns similarly unconnected with the diamond industry, and the Group cash assets less liabilities totalled £73,339,394 (1954—£70,709,770).

PROSPECTS OF THE DIAMOND TRADE

The diamond market was extremely active throughout 1955, and the sales made by the Central Selling Organisation reached a record figure of £74,288,695, consisting of £50,253,947 of gem diamonds and £24,034,748 of industrials. This was £4,626,769 more than the previous highest annual sales in 1952.

As I stated in my review last year, the demand for gem diamonds continues to be greater than production, and this is still the case, notwithstanding the increased production in the year under review from The Consolidated Diamond Mines of South West Africa, Limited, which I envisaged last year. A full year's operation at the increased output will improve the supply position to some extent. The new large-scale treatment plant at Williamson Diamonds Limited in Tanganyika, which comes into operation this year, should also help to alleviate the shortage of gem diamonds.

I confidently expect sales of gem diamonds in the current year to continue at the high rate which we have achieved in recent years, and consequently I look to the future with confidence.

The long-term forecast of industrial diamond sales is, to a great extent, influenced by the stockpiling purchases by the United States authorities, and as these will continue anyhow during 1956, I therefore foresee satisfactory sales. But I must repeat once again that when stockpiling purchases cease we will be faced with over-production, and additional outlets must be found. It is with this in view that your Company continues to take the lead in the research field in its efforts to find additional outlets for industrial diamonds.

MALAYA—Mining Engineers required for Group of Tin Mining companies. Only trained personnel considered. Commencing salary according to training and experience. Provident fund and non-contributory pension scheme. Three year contracts with six months' home leave on full pay. Write, giving full particulars of age, education, training and experience and marital status. Box 930, Walter Skinner, Ltd., 20 Copthall Avenue, London, E.C.2.

AFRICAN AND EUROPEAN INVESTMENT COMPANY LIMITED

(Incorporated in the Union of South Africa)

SATISFACTORY PROGRESS OF O.F.S. INTERESTS

MR. T. COULTER ON THE COAL INDUSTRY

The following are extracts from the statement by the chairman, Mr. T. Coulter, which has been circulated with the annual report and accounts:—

The profit earned during the year ended December 31, 1955, was £923,768 as compared with £902,300 in 1954 and £855,194 in 1953. Income derived from dividends and interest improved from £468,483 in 1954 to £633,606. This was mainly due to maiden dividend declarations by President Brand Gold Mining Company, Limited and President Steyn Gold Mining Company, Limited. Net profit on share transactions declined from £348,830 in 1954 to £137,173 in consequence of inactive market conditions.

Provision for taxation amounted to £98,000. General reserve was strengthened by the transfer of £150,000 and dividend declarations were maintained at 6 per cent. on the preference capital and 2s. 6d. per unit on the ordinary capital, absorbing in all £627,500. The unappropriated profit carried forward was £252,026 as against £225,454 brought forward from 1954.

INVESTMENTS HIGHER

Investments in shares increased during 1955 to £8,029,115, being a net increase of £890,931, of which £868,403 was in quoted securities, principally Orange Free State gold mining companies. Notwithstanding the increase in the book cost of quoted shares, the market value of our holdings declined to £14,535,075 at December 31, 1955, as compared with £16,295,185 at the end of 1954. This depreciation was almost wholly in O.F.S. gold mining shares.

Loans to affiliated companies and others were reduced during the year by £281,096 to the figure of £1,699,721. This figure includes sums advanced to developing O.F.S. gold mines and to certain companies concerned with asbestos and chrome mining. In view of the strength of the revenue reserves we have not thought it fit to make any specific provisions against the possible irrecoverability of some of these loans but it may be necessary to do so in the future when the position of these borrowers becomes more clearly defined.

THE ORANGE FREE STATE GOLD MINING INDUSTRY

The progress of mining operations since the first mine came to production towards the end of 1951 is illustrated by the following comparative figures of output:

	Tons Milled	Revenue £
1951	144,000	230,421
1952	1,206,000	2,798,125
1953	2,124,000	5,358,605
1954	4,434,000	13,717,663
1955	7,204,000	27,528,320

In addition, of course, considerable revenue is being derived from the production of uranium. At the end of the December quarter 1955, working profits from the production of uranium and sulphuric acid on the mines in the Orange Free State were running at the rate of over £3,000,000 a year.

In the last quarter of 1955 the Western Holdings, President Brand, and President Steyn companies paid maiden dividends of 1s. 6d., 1s. and 6d. per share respectively. These three companies declared interim dividends of 1s. 6d., 1s. 6d. and 9d. per share respectively in March of 1956.

THE SOUTH AFRICAN COAL INDUSTRY IN 1955

In March, 1955, producers of bituminous coal in Natal were granted an increase of 1s. 8d. per ton in the controlled price of coal sold in the inland market. This increase, together with the benefit of good f.o.b. prices for a limited amount of bunker and export coal, has raised the average pitmouth price realized by Natal collieries to about 17s. per ton.

In November, 1955, the Transvaal and O.F.S. producers received long overdue relief when the Price Controller granted an increase of 1s. 8d. per ton in the pithead price of bituminous coals, other than duff coal for which increases ranging from 2s. 6d. to 3s. per ton were awarded. Excluding the road haulage levy the present controlled pithead prices are:

Duff coal:	Per short ton
(a) For a calorific value not exceeding 12 lbs./lb.	8s. 4d.
(b) For a calorific value exceeding 12 lbs./lb.	8s. 10d.
All other Coals:	
(a) For a calorific value not exceeding 12 lbs./lb.	10s. 6d.
(b) For a calorific value exceeding 12 lbs./lb.	10s. 11d.

These prices will no doubt strike overseas readers as remark-

ably low—as indeed they are in comparison with pithead prices anywhere else in the world.

Much progress will have to be made in the technique of designing and operating atomic reactor stations, and many years will elapse before fissionable material becomes a serious competitor of coal in the production of electric power in areas close to the coalfields. On the other hand, power stations that are far distant from the coalfields may, within a decade or so, find it economically possible to supplement existing capacity by installing nuclear reactors.

SALES

During the year 1955 the total sales of coal mined in the Union amounted to 33,060,650 tons, as compared with 30,844,118 tons in 1954. Collieries in which your company is directly or indirectly interested sold 15,205,027 tons, representing 46 per cent. of the total.

Excluding coke produced by the South African Iron and Steel Industrial Corporation Limited for its own purposes, the total Union output of coke in 1955 was 713,300 tons, of which a colliery in which your company is interested produced 477,073 tons, equal to 66.9 per cent. of the total.

GENERAL

In his review last year the Chairman mentioned that the company was at an interesting stage in its history, and he had in mind the anticipation of dividend income from the Orange Free State gold mines in which your company has become increasingly and heavily interested over the past 19 years. The principal investments are in President Brand Gold Mining Company, Limited, President Steyn Gold Mining Company, Limited, and Welkom Gold Mining Company, Limited.

The first two of these have commenced paying dividends and the rates of declarations can reasonably be expected to increase over the next few years.

The Welkom Gold Mining Company, Limited, has not yet reached this stage but in view of the rise in development values over widespread areas of the mine, there is reason for quiet optimism regarding its future.

Our investment in coal, although not spectacular in revenue production potential, nevertheless remains a steady and increasing source of income, and will continue to do so for many years to come.

WOLVERHAMPTON DIAMOND DIE & TOOL Co. Ltd.

BOARTS and INDUSTRIAL DIAMONDS Exporters

11 HATTON GARDEN,
LONDON, E.C.1

Telephone: HOLborn 3017 Cables: Pardimon, London

ASHANTI GOLDFIELDS CORPORATION

SATISFACTORY RESULTS MARRED BY GENERAL STRIKE

Presiding at the annual meeting of the Corporation held on May 16 in London, **Major-General Sir Edward L. Spears, Bart., K.B.E., C.B., M.C., F.Inst.D.** (the Chairman), said that but for the fourteen weeks' general strike from November 20, 1955, to February 27, 1956, he would have a generally satisfactory report to make.

For the third year in succession, the tonnage treated was a record for the mine; and gold production in the year was the highest since the war. The technical position of the mine was very strong.

Ore reserves were sufficient for some years ahead, and there was promise of considerable new tonnage being developed.

Commenting on the strike, the Chairman said that on all the mines it had brought nothing but hardship to the workers and loss to the industry. Correspondence which had passed between the Union Headquarters and the Chamber of Mines since the strike ended entitled them to entertain some hope that good relations would be restored and that there would be no recurrence of that kind of trouble.

Referring to the political situation on the Gold Coast, the Chairman said he thought all parties recognized the vital part the mines played in the economy of the country, and he did not believe that any party had any desire to alter or interfere with the way the industry was owned and run. He did not consider major disturbances were inevitable. He believed a settlement could and should be reached between the two opposing parties—the C.P.P. of the present Government and the N.L.M. of Ashanti and the Northern Territories.

The Chairman concluded: I am very glad that the Colonial Secretary has announced that elections must be held before Independence is granted. The British Government has still an important part to play and I think that, wisely handled, a satisfactory settlement can be reached provided firmness is displayed and our clear intention not to allow anything approaching civil war to take place is asserted.

The report was adopted.

GOLD COAST MAIN REEF

The twenty-second annual general meeting of Gold Coast Main Reef, Ltd., was held on May 11 in London.

Mr. C. J. Burns (alternate Director for the Chairman, Major-General W. W. Richards, C.B., C.B.E., M.C.), presided.

The following is an extract from the Statement of the Chairman circulated with the Report and Accounts for the year ended June 30, 1955. The profit of £80,641, before appropriations, was not unsatisfactory, being only £3,278 lower than that of the previous year.

A dividend of 5%, less income tax, was paid, costing £30,645. After charging £41,098 for Taxation, there remained a balance of £25,776 carried forward, as against £16,878 brought in.

The following brief comments bring the position of the three Sections: Bondaye, Tuappim and Ekotokroo up to date:—

(a) **Bondaye**.—Shareholders are aware of the poor zone encountered between the 16th and 18th Level horizons in the Bondaye Main Shaft Section; and of the urgency with which we commenced sinking the main shaft to the 20th Level so that the reef could be explored at greater depth.

The strike of African workers delayed this vital work. Driving and crosscutting was resumed as expeditiously as possible in March this year and we are now anxiously awaiting news of the first results.

(b) **Tuappim**.—The latest development from the Tuappim Section 15th Level showed a total continuous payable length in No. 1505 Slope Drive North of 125 feet averaging 12.06 dwts. per ton over a width of 91.1 inches, equal to 1,099 inch/dwt.

(c) **Ekotokroo**.—From Ekotokroo No. 3 Level a total of 1,572 feet of driving and crosscutting was continued up to and beyond the Ariston Boundary. Reef was exposed on the Ariston side for 140 feet averaging 14.82 dwts. per ton over a width of 77.8 inches.

The Ore Reserves, at June 30, 1955 (including ore in pillars) were computed at 324,348 tons, averaging 8.54 dwts. per ton over a width of 70.9 inches—a net decrease of 16,483 tons during the year.

The report and accounts were adopted.

BIBIANI (1927) LTD.

STRENUOUS EFFORTS TO ASSURE COMPANY'S FUTURE

The Twenty-ninth Annual General Meeting of Bibiani (1927) Limited was held on May 16 in London.

Major-General Sir Edward L. Spears, Bt., K.B.E., C.B., M.C., F.Inst.D., chairman and managing director, presided, and, in the course of his speech, said:—

The 14 weeks' general strike on the mines was particularly unfortunate for Bibiani. It involved a loss of £115,000.

Bibiani, being a low grade mine, cannot reduce this loss during the current year by any other means than by making the maximum possible economies while keeping up production to about 6,500 oz. from 30,000 tons monthly. We do not expect to make an overall operating profit this year. For the first half year the loss amounted to £77,000. In April the profit was £9,487. We hope to obtain about the same results for the remaining five months of the financial year, which should reduce the operating loss for the year to some £20,000.

The strike not only caused a heavy financial loss, but also held up the development programme.

Every effort is being made to make up for lost time. Bibiani's future depends on finding and developing new ore resources. Present reserves are sufficient for about four years at the present rate of production, so that this is now an urgent problem.

At the northern end of the mine no ore has yet been developed below No. 12 Level. Interesting but erratic values have recently been found at the northern end of 15 Level (4 ON) but it is too early to attempt to assess their significance.

By the end of the year we should know what tonnage we are likely to get from the south shoot on Nos. 21 and 20 Levels and what the prospects are likely to be on No. 15 Level. Later No. 24 Level will also be explored by a drive north.

Finally, a programme of surface prospecting is being carried out which should provide useful information.

HOPEFUL DEVELOPMENT OUTLOOK

Dr. Junner, our geological consultant states that there is no valid geological reason for thinking that the north ore shoots have permanently failed. He attributes the deterioration in the orebodies on No. 15 and No. 18 level to a local structural barrier to the ore solutions similar to the barrier which caused the severe constriction in the South ore shoot between No. 9 and No. 12 levels, and believes that more favourable conditions for ore deposition might reasonably be expected to recur below and around the barrier. Development during the next year on No. 15 and No. 18 levels and by diamond drilling between No. 18 and No. 21 levels should provide significant clues to the structure and ore possibilities.

No new ore has been developed in the south ore body for the last two years, owing to concentration on other work, but some 304,000 tons were developed in the north ore body during the same period, 75,500 tons of this in the period under review.

The fall in the reserves from 1,783,533 to 1,481,048 by 302,000 tons in the year under review is only partly due to the fact that more ore was extracted during the year than was developed. A further reason is that over a hundred thousand tons on the 12-15 Level block in the south ore body were taken out of the reserves when these were recalculated as at September 30, 1955, as unpayable in present circumstances.

The profit, £79,935 after charging tax, was £12,900 more than in the preceding year, and costs in spite of the increased allocation to development were down by 3s. This result reflects the greatest credit on Mr. Wilson and his staff. It would be altogether satisfactory but for the effect of the strike.

It was with great regret that we were unable to recommend a final dividend for the financial year ended September 30, 1955. The results were up to expectations and would have justified the same distribution as for the previous year. But you will realize from what I have said about the cost of the strike that the drain on our liquid resources made this decision inevitable.

Moreover, to carry out the essential development to which I have referred will cost more than we have been spending on this in previous years, and we cannot allow ourselves to run short of the necessary resources to take all possible steps to prolong the life of the mine.

Fortunately, Bibiani's liquid position before the strike was strong, and we do not expect any difficulty in meeting our commitments.

On the other hand, Bibiani is in no position to pay increased wages except by increased productivity.

The report and accounts were adopted.

CAMP BIRD

POWER CONTROLS FOR INDUSTRY

MR. JOHN DALGLEISH'S STATEMENT

The fifty-fourth annual general meeting of Camp Bird, Ltd., was held on May 10 in London, Mr. John Dagleish, the chairman, presiding.

The following is an extract from his review circulated with the report and accounts for the year ended December 31, 1955:—

Nineteen fifty-five was an extraordinary year in the life of our Company. It saw record profits—substantially higher than anything previously achieved.

I am pleased to report that in our industrial programme we are nearing completion of the basic position. I want shareholders to understand that your Directors are pursuing a logical development.

We feel that the development of every industrial group should, in essence, have a motif. In the case of Camp Bird Industries the motif has logically developed into the provision of power controls for industry.

You will find, on examination of the industries now under our management, that they establish themselves at control and movement points of industry, with particular reference to the growth industries of to-morrow.

INDUSTRIAL MOVEMENT AND CONTROL

At every stage of industry there is the problem of movement and control and the measurement of movement. Camp Bird have stationed themselves at these strategic points.

It is well to realize that, as industry develops into the nuclear and automated fields, the demands on control mechanisms become more and more exacting.

PULSOMETER ENGINEERING CO. LTD.

Eighty years ago the Pulsometer Engineering Co. Ltd. was established to manufacture pumps for industry.

With the acquisition of Joseph Evans, the 146-year-old Wolverhampton foundry, Pulsometer became an organization making pumps throughout a wide range of movement of oil, water, powdered solids and air. Pulsometer is particularly renowned for oil moving mechanisms used in the world's great oil refineries and jet fighters alike.

Some 1,500 workers are employed in factories covering 333,000 sq. ft. A considerable extension is now being built at the Reading plant.

Additional to its own range of technically excellent and far-advanced products, Pulsometer also enjoys a licence agreement with American Pacific Pump Inc. of California, U.S.A.

R. H. WINDSOR LTD.

This company is effectively a group of companies within our main grouping. The main Windsor Company is one of the world's largest and finest manufacturers of injection and extrusion machinery for the plastic industry. Between 40 and 50 per cent. of total production is exported, there being no fewer than 136 "Windsor" plants in Canada and the United States.

Three factories at Chessington, Hanworth and Wembley employ over 400 workers building modern high precision engineering machines, ranging from one ton up to 64 tons in weight.

The new giant Windsor injection moulding machine will mould 10 lbs. of plastic in one shot, and opens up the prospect, for the first time, of the moulding of such things as motor-car dash-boards in a single impression.

Windsor's unique twin-screw extrusion machines are coming into world-wide demand as plastic materials continue to take over from metals in the field of pipe and tube manufacture.

Klaxon Ltd., the wholly-owned subsidiary of Windsor, is a household word. The famous Klaxon horn, and its modern electrical successors, are in greater demand than ever before. You will hear a Klaxon on the decks of the *Queen Mary* and in the deepest shafts of the South African gold mines.

But Klaxon has also become a leader in the field of high quality fractional horse-power electrical motors and geared units, meeting the demands of modern industry for ever smaller and more efficient power units.

Klaxon operates factories at Tyseley, Birmingham, and Buckingham, and employs a highly trained engineering and assembly staff of over 450 workers.

J. LANGHAM THOMPSON GROUP

Four separate but related Companies form the J. Langham Thompson group of companies, engaged in the electronics field.

Founded by the present Chairman and Managing Director, Mr. J. Langham Thompson, the Companies have assumed a

pre-eminent position in the field of electronic engineering. Many government contracts are being carried out.

The group is increasingly entering the commercial field. The manufacture of the Sorensen Voltage Regulator is now on a production line basis (just a word of explanation—automation and fine engineering control generally will be impossible without close control of voltage fed into the plants. The Sorensen regulator evens up the present uneven flow within the wide fluctuations of electricity supply. It is, in fact, the new essential tool without which automation will just not happen).

In the field of new electronic measuring devices J. Langham Thompson stand supreme as the designers and manufacturers of strain gauges—devices to measure the load or strain at a particular point and to permit remote reading and control.

A SENSATIONAL CAMERA

But the most sensational development to come from this group has been the Courtney-Pratt Highspeed Camera, which takes no less than 125,000 pictures *per second*. This instrument has opened new frontiers for observation of such things as the movement of a shell or bullet, what happens in a breech mechanism, and many other unsolved mysteries of industry.

The first production line of these truly miracle cameras is now in being; and demand is growing in all parts of the world for this product of Britain's scientific brains.

OTHER DEVELOPMENTS

The establishment of two further industrial companies is well advanced and full announcements will be made in due course.

One of these companies opens up new fields in the control of steel flow; and your Company has recently acquired the rights to a steel cold-forging process.

The second company is planned to enter the electronics field on the audio side in conjunction with a famous American manufacturer of such products.

CAMP BIRD INDUSTRIES, LTD.

I hope this necessarily condensed view of our new industrial group helps to explain our motif, and the way we have sought to achieve the answer.

So whether it be solid, liquid or gaseous, your industrial companies will move it, weigh it, measure it, control it, see it, and listen to it! And if the impulse is physical we can probably convert it into a radio wave, then make it into a visible record.

FINANCIAL MATTERS

This brings me to the question of finance. I should explain the financial policy being pursued by your Board.

Firstly, our industrial companies have been selected—quite outside their undoubted technical excellence—because they form a coherent group for a programme of introduction to the Stock Exchange as quoted companies. This we regard as being the responsibility of Camp Bird in its financial role.

Secondly, we regard it as sound financial practice that Camp Bird should make available to the public some part of its total investment in each Company as they eventually take their place in the stock markets. There is nothing static in our concept of Camp Bird's future activities.

Shareholders will now appreciate how vastly our position has changed since last year, and why this review has effectively become an assessment of 1956 rather than of 1955!

It is still the Board's policy, however, to maintain a strong portfolio of gold shares; and therefore we are seeking permission to make a rights' issue to shareholders to finance, in part, the money we have expended or contracted to expend in creating our industrial group; and I would only add here that already it seems we shall enjoy a greater profitability from our industrial acquisitions alone this year than we did from our whole portfolio in 1954.

This, I hope, you will regard as an achievement and as a promising augury for the future of our group, which is, throughout, expanding production, profits and production facilities.

FUTURE EARNINGS

It is difficult to make an accurate assessment of our income this year. However, the profitability of our industrial group alone will—unless the situation changes radically for the worse—lead to earnings in excess of £300,000 this year. So, even allowing for the probability of a larger capital, it is reasonable to expect our new level of dividend at 20 per cent. to be upheld this year, and I hope improved in subsequent years.

I think we may reasonably regard Camp Bird as a growth company, with a potential equal to any other company for a lively and prosperous future, with compatible and complementary interests in both the traditional mining and the newer industrial fields.

The report and accounts were adopted.

THE BRITISH PETROLEUM COMPANY

SUBSTANTIAL PROGRESS IN ALL ASPECTS OF BP GROUP'S OPERATIONS

FULL PART IN MEETING WORLD'S EXPANDING DEMAND

MR. B. R. JACKSON ON THE TASK AHEAD

The forty-seventh annual general meeting of The British Petroleum Company Limited will be held on June 7 at Britannic House, Finsbury Circus, London, E.C.

The following is an extract from the circulated statement of the Chairman, **Mr. B. R. Jackson** :—

In addressing you for the first time as Chairman, I must begin by paying high tribute to the great services to the Company of my predecessor, Lord Strathalmond. His decision to retire on March 31 last ended a period of thirty-three years as a Director. The BP group's remarkable expansion over that period, as instanced by the growth of its sales from 3,000,000 tons in 1923 to 48,000,000 tons last year, testifies to the outstanding ability, foresight and leadership of Lord Strathalmond in the conduct of your affairs.

During 1955 substantial progress was made in all aspects of the BP group's operations. Our total sales increased by 15 per cent., crude oil production by 25 per cent., and refining throughput by 23 per cent., while exploration and marketing operations were further diversified and extended. The Company thus played a full part in meeting the free world's expanding demand for petroleum, which increased by 11 per cent. in 1955, continuing the post-war trend which has resulted in a doubling of world consumption of oil products in the last ten years.

The roots of this strong demand lie not only in the growth of industrial activity and improving standards of living; they also, in the Eastern Hemisphere, lie in the more limited capacity for increasing output of the other major sources of energy, especially coal. There is every indication that this combination of factors will maintain the post-war rate of expansion in world petroleum consumption until nuclear power becomes available to supplement world energy resources on a substantial scale. Thus in the next ten years the world petroleum industry may well be again called upon to double its present output. The rate of expansion can be expected to continue, as now, to be greater in the Eastern Hemisphere, where this Company mainly operates; and the Middle East oil-producing territories, in which we have so substantial a position, are expected to contribute an increasingly large proportion of the world's requirements.

The discovery, production, refining, transportation and distribution to the consumer of the oil supplies needed to meet such a future demand can only be achieved by large-scale capital expenditure on the facilities necessary for each of these operations. The oil industry generally, and the BP group as one of its major components, will have to provide for the greater part of this expenditure from its own resources. If the industry is to maintain its record of meeting all consumers' needs, the performance of the task which lies ahead of it will require both adequate economic price-levels and the continued ploughing back of a high proportion of earnings to finance future growth.

THE ACCOUNTS

The Consolidated trading profit and other income for 1955 before providing for Depreciation and Overseas Taxation was £139,817,943, compared with a corresponding figure of £118,228,792 for 1954.

Depreciation totalled £22,143,401 compared with £30,406,091 for 1954. The reduction of £8,262,690 is mainly under the heading of Fixed Assets on which expenditure in 1955 was considerably lower than in 1954. The reduced capital expenditure marks the virtual completion of the recent heavy programme of refinery expansion and tanker construction, but as indicated by the figures totalling £97,200,000 mentioned in the Accounts, capital expenditure is certain to be heavy if the Company is to keep pace with the frequently changing improvements and expansion of the oil industry.

The 1955 figure of Overseas Taxation of £62,691,602 compares with £42,879,851 for 1954, the increase in the main being due to our larger offtake of oil from the countries concerned. Provision for United Kingdom taxation, after double taxation relief, amounts to £8,697,875.

The amount available for Reserves and Dividends is £46,189,539 compared with £17,043,404 for 1954. In view of anticipated requirements for future capital expenditure, your Directors have placed £28,500,000 to General Revenue Reserve and have recommended a final dividend on the Ordinary Stock of two shillings per £1 stock unit free of income tax, making

a total for the year of three shillings per £1 stock unit free of income tax. The total now standing to the credit of General Revenue Reserve is £75,000,000.

The total capital expenditure of the Group during 1955 was approximately £43,000,000.

PRODUCTION

Our total crude oil production in 1955 was 46,000,000 tons, over 9,000,000 tons more than in 1954, the increase being mainly due to larger production in Iran and Kuwait.

In the United Kingdom, although production from the older fields decreased to about 54,000 tons from 59,000 in 1954, we were encouraged by the new production discovered during the year at Egmont, six miles north of the Eakring field. Six wells have been completed in this new field and are now yielding a production more than sufficient to offset the decline from the older fields.

The Chairman then reviewed the production and exploration operations in the various overseas territories in which the Group had interests.

REFINING

Our total refinery throughput in 1955 was 29,500,000 tons, 5,500,000 tons more than in 1954. This increase was mainly due to 1955 being the first complete operating year of Aden refinery, and the first operating year of Kwinana refinery in Western Australia, commissioned in February, 1955; also to our share of processing at Abadan during its first complete year's operation under the Consortium agreement of October, 1954.

In Great Britain, the total throughput of our Kent, Llandarcy, and Grangemouth refineries decreased by some 2,000,000 tons to 8,500,000 tons; this being due to the major increases in offtake from Aden, Kwinana and Abadan replacing the uneconomically routed products which had, during the last four years, to be drawn from the United Kingdom refineries to assist in the supply of our Eastern markets.

At Kent, where lubricating oil production at 84,000 tons was more than double the 1954 figure, crude distillation capacity, now 4,600,000 tons, is to be increased to over 7,000,000 tons. New plant for the manufacture of aviation spirit and improved diesel fuels is to be installed, and a further catalytic reformer to increase production of high grade motor spirit.

At the Grangemouth plant of British Hydrocarbon Chemicals Ltd. production of industrial alcohols reached a new high level.

The statement then referred to the refinery operations in France, Germany, Belgium, Italy, Aden, Kuwait, Australia and Iran, and continued :—

SEA TRANSPORT : The British Tanker Company's fleet now consists of 144 ships totalling 2,018,000 deadweight tons and we have also about 2½ million tons of tanker shipping on charter. There are now 41 ships totalling 1,225,500 deadweight tons under construction or on order for the British Tanker Company. The estimated cost of this building programme exceeds £80 million.

DISTRIBUTION AND SALES

In 1955 world consumption of petroleum outside the Soviet sphere was approximately 700 million tons, an increase of nearly 70 million tons or about 11 per cent. In the Eastern Hemisphere, where our main interests lie, consumption expanded by about 15 per cent. (which compares with an average of nine per cent. during the previous three years), the main contribution being a 17 per cent. increase in Western Europe, including the United Kingdom; this remarkable gain was due to a combination of generally high industrial activity with the inability of coal and other fuel sources to satisfy the demand for energy needed to maintain such activity.

The BP group's sales of crude oil and refined products in 1955 attained the record level of 48 million tons, an increase of more than 6 million tons or 15 per cent. over the 1954 total.

In the United Kingdom, total demand for petroleum products expanded by nearly 10 per cent. in 1955. In the case of fuel oil the increase was over 20 per cent., a plain indication of its rapidly expanding contribution to the energy needs of this country.

We have continued to strengthen and expand our direct marketing outlets; the capital expenditure involved is well justified by the increased assurance which it gives us of continuity of offtake.

The international coverage of BP Aviation Service and our sales of aviation fuels are steadily expanding.

The BP International Oil Bunkering Service, now in its thirty-sixth year of operation, is established at more than 160 ports on world shipping trade routes.

Sales of our lubricants have increased very satisfactorily. BP Energol brands have been introduced successfully in the following new areas: Portugal, Spanish Morocco, Tangier, Gibraltar, British and French West Africa, Iceland and Madeira. Our new motor oil, BP Energol Visco-Static, has established itself in a foremost position as a multigrade oil in the United Kingdom, on the Continent and in Australia. Good progress also continues to be made in the international marine oil market.

There is still no sign of any reduction in the heavy burden of taxation levied on motor fuel which is holding back the natural increase in consumption of motor spirit throughout most of the area in which we market. This position handicaps the oil industry, despite its great flexibility, in its effort to provide the quantities of fuel oil required to meet the rising demand for energy.

The work of our Research and Development Department has been further extended during the year, with particular emphasis on ensuring the highest quality of all our products.

MINING ENGINEER, age 30/45 approx. required at Gold Coast Bauxite Mine. Tours of 15 months, 3 months' leave between tours. Passages paid. Permanent. Apply in writing to Box M.J. 660 LPE, 55 St. Martin's Lane, London, W.C.2.

The Board of Trade has for disposal about 490 tons **AUSTRALIAN RUTILE SAND** (minimum 95 per cent TiO_2) packed in bags, lying in store in North Wales.

Full particulars and forms of tender (returnable by 5th June, 1956) may be obtained on application to the Board of Trade, C. & G. 8(B), Room 317, Lacon House, Theobalds Road, London, W.C.1. (Telephone: Chancery 4411, Ext. 329/330).

HER MAJESTY'S OVERSEA CIVIL SERVICE

Inspectors of Mines, Tanganyika

Qualifications: A University Degree or a Diploma of a School of Mines in Metalliferous Mining (or a similar qualification obtained in one of the Dominions) together with a minimum of 2 years' post-graduate professional experience.

Age limit: Not more than 35 years.

Duties: Administration of the laws as to prospecting and mining and the guidance, control and inspection of mine development and working.

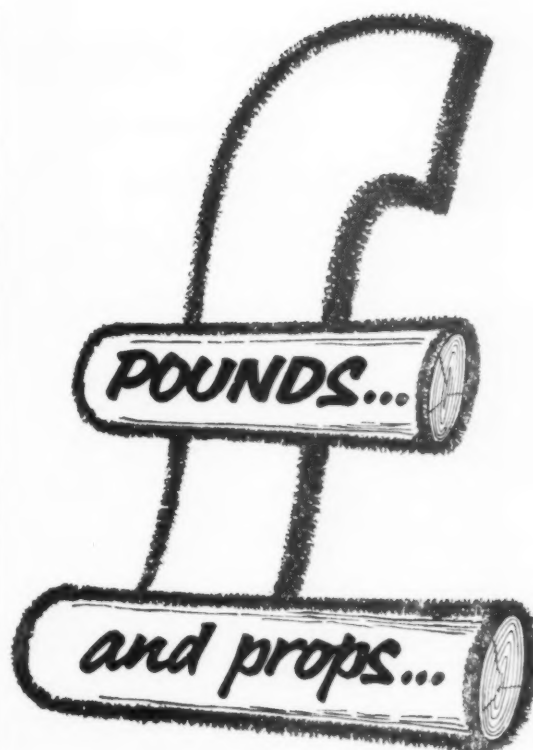
Terms of Appointment: On probation to the pensionable establishment. Emoluments in the scale £852—£1,620 p.a. plus 10 per cent cost-of-living allowance. Outfit allowance. Free passages on appointment and on leave. Generous leave. Quarters if available at rental. Free medical attention. Income tax at local rates.

Apply to Director of Recruitment, Colonial Office, London, S.W.1. State age, qualifications and experience. Quote BCD 99/8/01.

AGENCE MINIÈRE ET MARITIME S A

2, RUE VAN BREE — ANTWERP — BELGIUM
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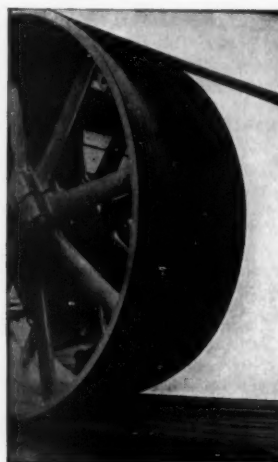
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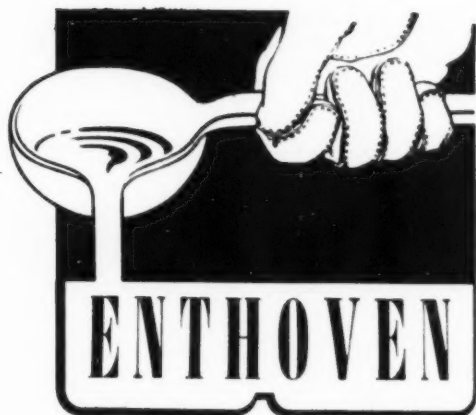
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